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| (54) Title: TECHNIQUES AND APPARATUS FOR ENTERTAINMENT SITES, AMUSEMENT PARKS AND OTHER INFORMATION AND/OR ENTERTAINMENT DISPENSING SITES | | | |
| (57) Abstract An amusement park apparatus (figs. 33A-35) including a first plurality of entertainment nodes (2214), playing a second plurality of games with a third plurality of players who are simultaneously playing the second plurality of games, a node controller (2010) operative to assign each player from among the third plurality of players to an individual game from among the second plurality of games and operative to control each individual node from among the first plurality of nodes such that when the individual node enters into an interaction with an individual player, the node plays, with the individual player, the game assigned to the individual player, and a communication network operative to associate each of the first plurality of nodes (2214) with the node controller (2010). | | | |
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TECHNIQUES AND APPARATUS FOR ENTERTAINMENT SITES, AMUSEMENT PARKS AND OTHER
INFORMATION AND/OR ENTERTAINMENT DISPENSING SITES

FIELD OF THE INVENTION

The present invention relates to apparatus and methods for amusement parks and to apparatus and methods for dispensing information and other services.

BACKGROUND OF THE INVENTION

Amusement parks and other crowd-servicing centers typically comprise a plurality of service-providing nodes which are typically manned by human operators.

Locating badges, worn by mobile units of a system such as by medical personnel in a hospital system, or by mobile medical equipment in a hospital system, are known. The badges enable the location of individual medical personnel to be determined at any given time such that, for example, telephone calls may be directed to a particular person at his current location.

Automatic teller machines are interactive automated points of service which are conventionally associated with a central computer via a wired network.

Magnetic cards are conventionally held by members of an organization, such as employees in a company, and are used to provide a number of functions such as access control to access-limited locations, time-stamping, and recordal of utilization of services such as cafeteria services.

Also well known in the art are toys which are remotely controlled by wireless communication and which are not used in conjunction with a computer system. Typically, such toys include vehicles whose motion is controlled by a human user via a remote control device.

US Patent 4,712,184 to Haugerud describes a computer controlled educational toy, the construction of which teaches the user computer terminology and programming and robotic technology. Haugerud describes computer control of a toy via a wired connection, wherein the user of the computer typically writes a simple program to control movement of a robot.

US Patent 4,840,602 to Rose describes a talking doll responsive to an external signal, in which the doll has a vocabulary stored in digital data in a memory which may be accessed to cause a speech synthesizer in the doll to simulate speech.

US Patent 5,021,878 to Lang describes an animated character system with real-time control.

US Patent 5,142,803 to Lang describes an animated character system with real-time control.

US Patent 5,191,615 to Aldava et al. describes an interrelational audio kinetic entertainment system in which movable and audible toys and other animated devices spaced apart from a television screen are provided with program synchronized audio and control data to interact with the program viewer in relationship to the television program.

US Patent 5,195,920 to Collier describes a radio controlled toy vehicle which generates realistic sound effects on board the vehicle. Communications with a remote computer allows an operator to modify and add new sound effects.

US Patent 5,270,480 to Hikawa describes a toy acting in response to a MIDI signal, wherein an instrument-playing toy performs simulated instrument playing movements.

US Patent 5,289,273 to Lang describes a system for remotely controlling an animated character. The system uses radio signals to transfer audio, video and other control signals to the animated character to provide speech, hearing vision and movement in real-time.

US Patent 5,388,493 describes a system for a housing for a vertical dual keyboard MIDI wireless controller for accordionists. The system may be used with either a conventional MIDI cable connection or by a wireless MIDI transmission system.

German Patent DE 3009-040 to Neuhierl describes a device for adding the capability to transmit sound from a remote control to a controlled model vehicle. The sound is generated by means of a microphone or a tape recorder and transmitted to the controlled model vehicle by means of radio communications. The model vehicle is equipped with a speaker that emits the received sounds.

The disclosures of all publications mentioned in the specification and of the publications cited therein are hereby incorporated by reference.

SUMMARY OF THE INVENTION

The present invention seeks to provide improved apparatus and methods for dispensing amusement services, information services and other services to crowds.

There is thus provided in accordance with a preferred embodiment of the present invention amusement park apparatus including a first plurality of entertainment providing nodes playing a second plurality of games with a third plurality of players who are simultaneously playing the second plurality of games, a node controller operative to assign each player from among the third plurality of players to an individual game from among the second plurality of games and operative to control each individual node from among the first plurality of nodes such that when the individual node enters into an interaction with an individual player, the node plays, with the individual player, the game assigned to the individual player and a communication network operative to associate each of the first plurality of nodes with the node controller.

There is also provided in accordance with a preferred embodiment of the present invention amusement park apparatus including a first plurality of entertainment providing nodes each operative to sequentially participate in any of a second plurality of games being played, a node controller operative to control the first plurality of nodes, and a communication network operative to associate each of the first plurality of nodes with the node controller.

There is additionally provided in accordance with a preferred embodiment of the present invention amusement park apparatus including a first plurality of entertainment providing nodes, a node controller operative to control the first plurality of nodes to play a second plurality of games such that at least one of the first plurality of nodes participates in each of at least two ongoing ones of the second plurality of games, and a communication network operative to associate each of the first plurality of nodes with the node controller.

Further in accordance with a preferred embodiment of the present invention the node controller is operative to control the first plurality of nodes so as to

accommodate a third plurality of players participating in at least two ongoing ones of the second plurality of games.

Still further in accordance with a preferred embodiment of the present invention the second plurality of games includes at least one group game in which at least one encounter between an individual player of the group game and one of the first plurality of nodes is affected by at least one previous encounter between at least one other player of the group game and at least one of the first plurality of nodes.

Also provided, in accordance with a preferred embodiment of the present invention, is a system for dispensation of infotainment, the system including a multiplicity of lifesize fanciful figures distributed in a crowd-accommodating area in which infotainment services are dispensed to a crowd, a central fanciful figure controller operative to provide at least some of the infotainment services to the crowd by controlling said multiplicity of fanciful figures and a communication network operative to associate each of the multiplicity of fanciful figures with the central fanciful figure controller.

Further in accordance with a preferred embodiment of the present invention, the crowd-accommodating area comprises an amusement park and the infotainment services comprise amusement park services.

Still further in accordance with a preferred embodiment of the present invention, at least a portion of the crowd-accommodating area comprises an outdoor area.

Further in accordance with a preferred embodiment of the present invention, a multiplicity of fanciful figures includes a plurality of stationary figures.

Still further in accordance with a preferred embodiment of the present invention, the multiplicity of fanciful figures includes at least one mobile figure.

Moreover in accordance with a preferred embodiment of the present invention at least some of the fanciful figures include a commodity dispenser.

Further in accordance with a preferred embodiment of the present invention the multiplicity of fanciful figures includes at least one talking figure.

Further in accordance with a preferred embodiment of the present invention a central fanciful figure controller is operative to continuously control the mobile figure even as it roams from one cell to another.

There is additionally provided in accordance with a preferred embodiment of the present invention an information providing system including a multiplicity of information providing nodes each including at least one sensor, other than an alphanumeric input device, for sensing events in its vicinity, an interactive central node controller operative to receive an indication of an event from an individual one of the information providing nodes and to control another one of the multiplicity of information providing nodes in accordance with the indication of the event, and a communication network operative to provide communication between each of the multiplicity of nodes and the central node controller.

Further in accordance with a preferred embodiment of the present invention the nodes are distributed in a crowd-accommodating area.

Still further in accordance with a preferred embodiment of the present invention at least one sensor includes an artificial vision system for sensing visual information in its vicinity.

Additionally in accordance with a preferred embodiment of the present invention at least one sensor includes an audio reception system for sensing audio information in its vicinity.

Moreover in accordance with a preferred embodiment of the present invention the audio reception system includes a speech recognition unit.

Still further in accordance with a preferred embodiment of the present invention at least one talking figure generates pre-recorded speech specimens.

Additionally in accordance with a preferred embodiment of the present invention at least one talking figure generates synthesized speech.

Moreover in accordance with a preferred embodiment of the present invention at least one talking figure assembles pre-recorded speech segments, thereby to generate speech.

Further in accordance with a preferred embodiment of the present invention at least one talking figure assembles synthesized speech segments, thereby to generate speech.

Still further in accordance with a preferred embodiment of the present invention the infotainment providing nodes include moving parts which are visible to a user.

Additionally in accordance with a preferred embodiment of the present invention the central node controller is operative to cause the infotainment providing nodes to take actions having known significance.

Moreover in accordance with a preferred embodiment of the present invention the actions having known significance include smiling, pointing and illuminating.

Further in accordance with a preferred embodiment of the present invention the sensor is capable of identifying an individual in its vicinity and the central node controller is operative to record the nodes which each individual has encountered.

Still further in accordance with a preferred embodiment of the present invention at least some of the infotainment providing nodes are operative to provide an individual with infotainment whose contents take into account the individual's past encounters with nodes of the system.

Additionally in accordance with a preferred embodiment of the present invention at least some of the infotainment providing nodes are operative to provide an individual with infotainment whose contents take into account other individuals' past encounters with nodes of the system.

Further in accordance with a preferred embodiment of the present invention the commodity dispenser is operative to dispense at least one of the following articles: gifts, prizes, coupons, maps, souvenirs, change, tokens.

Still further in accordance with a preferred embodiment of the present invention at least some of the infotainment providing nodes are operative to provide an individual with infotainment whose contents take into account at least one characteristic of the individual, e.g. language, age, preferences, disabilities.

There is additionally provided in accordance with a preferred embodiment of the present invention a two-way user servicing system including a multiplicity of game-playing nodes each including a user identity receiving device for identifying presence of an individual user, an interactive central node controller operative to receive from a particular node an indication of the presence of a particular user at the particular node and to control participation of at least one of the multiplicity of game-playing nodes in at least one game in accordance with the indication, and a communication network operative to provide communication between each of the multiplicity of nodes and the central node controller.

Further in accordance with a preferred embodiment of the present invention the node controller is operative to maintain, for at least one particular user, a record of nodes the particular user has visited and to control at least one node currently visited by the user in accordance with the record.

Still further in accordance with a preferred embodiment of the present invention the user identity receiving device includes a user identity input device.

Additionally in accordance with a preferred embodiment of the present invention the user identity receiving device includes a user identity sensing device.

Moreover in accordance with a preferred embodiment of the present invention the user identity sensing device includes a receiver for sensing a user-identifying transmission sent by a wearable tag.

There is additionally provided in accordance with a preferred embodiment of the present invention a two-way game system including a multiplicity of game participant nodes each including a user identity receiving device for identifying presence of an individual user, an interactive central node controller operative to receive from a particular node an indication of the presence of first and second users at the particular node and to instruct the particular node to play a first game with the first user, to play a second game with the second user, and a communication network operative to provide communication between each of the multiplicity of nodes and the central node controller.

There is additionally provided in accordance with a preferred embodiment of the present invention a method of providing entertainment, the method including providing a first plurality of entertainment providing nodes playing a second plurality of

games with a third plurality of players who are simultaneously playing the second plurality of games, providing a node controller operative to assign each player from among the third plurality of players to an individual game from among the second plurality of games and operative to control each individual node from among the first plurality of nodes such that when the individual node enters into an interaction with an individual player, the node plays, with the individual player, the game assigned to the individual player, and networking each of the first plurality of nodes with the node.

There is additionally provided in accordance with a preferred embodiment of the present invention a method of providing entertainment, the method including providing a first plurality of entertainment providing nodes each operative to sequentially participate in any of a second plurality of games being played simultaneously with any of a third plurality of players who are simultaneously playing the second plurality of games, controlling the first plurality of nodes, and networking each of the first plurality of nodes with the node controller.

There is additionally provided in accordance with a preferred embodiment of the present invention a method of providing entertainment, the method including providing a first plurality of entertainment providing nodes, controlling the first plurality of nodes to play a second plurality of games such that at least one of the first plurality of nodes participates in each of at least two ongoing ones of the second plurality of games, and networking each of the first plurality of nodes with the node controller.

There is additionally provided in accordance with a preferred embodiment of the present invention a method of providing entertainment, the method including distributing a multiplicity of fanciful lifesize figures in a crowd-accommodating area, controlling the multiplicity of fanciful figures centrally, and networking each of the multiplicity of fanciful figures with the central fanciful figure controller.

There is additionally provided in accordance with a preferred embodiment of the present invention a method of providing information, the method including providing a multiplicity of information providing nodes each including at least one sensor other than an input device for sensing events in its vicinity, interactively and centrally receiving indications of the events from the information providing nodes and controlling the multiplicity of information providing nodes in accordance with the indications of the

events, and providing networked communication between each of the multiplicity of nodes and the central node controller.

There is additionally provided in accordance with a preferred embodiment of the present invention a method of providing two-way user servicing, the method including providing a multiplicity of game-playing nodes each including a user identity receiving device for identifying presence of an individual user, interactively and centrally receiving from a particular node an indication of the presence of a particular user at the particular node and controlling participation of at least one of the multiplicity of game-playing nodes in at least one game in accordance with the indication, and providing networked communication between each of the multiplicity of nodes and the central node controller.

There is additionally provided in accordance with a preferred embodiment of the present invention a method of providing two-way gaming, the method including providing a multiplicity of game participant nodes each including a user identity receiving device for identifying presence of an individual user, interactively and centrally receiving from a particular node an indication of the presence of first and second users at the particular node and instructing the particular node to play a first game with the first user, to play a second game with the second user, and providing networked communication between each of the multiplicity of nodes and the central node controller.

Advantages of some of the preferred embodiments of the present invention, in which a record is maintained of the visitor's experiences in the amusement park, include:

- a. Visitors can be directed to attractions and/or games and/or nodes which they have not yet experience.
- b. Stimuli such as explanations provided to visitors can be adjusted to take into account what the visitor has already seen e.g. information already provided to a visitor may be omitted and information now being provided to the visitor may include an explanation of the relationship between the information now being provided to the user and information previously provided to the user.

According to a preferred embodiment of the present invention, questions posed by visitors to the nodes are recorded and analyzed off-line, typically by a human

operator, in order to identify questions for which a more satisfactory or different answer should be provided. The database is then updated, typically manually, so as to provide a more satisfactory or different answer.

There is also provided in accordance with a preferred embodiment of the present invention a wireless computer controlled toy system including a computer system operative to transmit a first transmission via a first wireless transmitter and at least one toy including a first wireless receiver, the toy receiving the first transmission via the first wireless receiver and operative to carry out at least one action based on the first transmission.

The computer system may include a computer game. The toy may include a plurality of toys, and the at least one action may include a plurality of actions.

The first transmission may include a digital signal. The first transmission includes an analog signal and the analog signal may include sound.

Additionally in accordance with a preferred embodiment of the present invention the computer system includes a computer having a MIDI port and wherein the computer may be operative to transmit the digital signal by way of the MIDI port.

Additionally in accordance with a preferred embodiment of the present invention the sound includes music, a pre-recorded sound and/or speech. The speech may include recorded speech and synthesized speech.

Further in accordance with a preferred embodiment of the present invention the at least one toy has a plurality of states including at least a sleep state and an awake state, and the first transmission includes a state transition command, and the at least one action includes transitioning between the sleep state and the awake state.

A sleep state may typically include a state in which the toy consumes a reduced amount of energy and/or in which the toy is largely inactive, while an awake state is typically a state of normal operation.

Still further in accordance with a preferred embodiment of the present invention the first transmission includes a control command chosen from a plurality of available control commands based, at least in part, on a result of operation of the computer game.

Additionally in accordance with a preferred embodiment of the present invention the computer system includes a plurality of computers.

Additionally in accordance with a preferred embodiment of the present invention the first transmission includes computer identification data and the second transmission includes computer identification data.

Additionally in accordance with a preferred embodiment of the present invention the at least one toy is operative to transmit a second transmission via a second wireless transmitter and the computer system is operative to receive the second transmission via a second wireless receiver.

Moreover in accordance with a preferred embodiment of the present invention the system includes at least one input device and the second transmission includes a status of the at least one input device.

Additionally in accordance with a preferred embodiment of the invention the at least one toy includes at least a first toy and a second toy, and wherein the first toy is operative to transmit a toy-to-toy transmission to the second toy via the second wireless transmitter, and wherein the second toy is operative to carry out at least one action based on the toy-to-toy transmission.

Further in accordance with a preferred embodiment of the present invention operation of the computer system is controlled, at least in part, by the second transmission.

Moreover in accordance with a preferred embodiment of the present invention the computer system includes a computer game, and wherein operation of the game is controlled, at least in part, by the second transmission.

The second transmission may include a digital signal and/or an analog signal.

Still further in accordance with a preferred embodiment of the present invention the computer system has a plurality of states including at least a sleep state and an awake state, and the second transmission include a state transition command, and the computer is operative, upon receiving the second transmission, to transition between the sleep state and the awake state.

Still further in accordance with a preferred embodiment of the present invention at least one toy includes sound input apparatus, and the second transmission includes a sound signal which represents a sound input via the sound input apparatus.

Additionally in accordance with a preferred embodiment of the present invention the computer system is also operative to perform at least one of the following actions: manipulate the sound signal; and play the sound signal.

Additionally in accordance with a preferred embodiment of the present invention the sound includes speech, and the computer system is operative to perform a speech recognition operation on the speech.

Further in accordance with a preferred embodiment of the present invention the second transmission includes toy identification data, and the computer system is operative to identify the at least one toy based, at least in part, on the toy identification data.

Still further in accordance with a preferred embodiment of the present invention the first transmission includes toy identification data. The computer system may adapt a mode of operation thereof based, at least in part, on the toy identification data.

Still further in accordance with a preferred embodiment of the present invention the at least one action may include movement of the toy, movement of a part of the toy and/or an output of a sound. The sound may be transmitted using a MIDI protocol.

There is also provided in accordance with another preferred embodiment of the present invention a game system including a computer system operative to control a computer game and having a display operative to display at least one display object, and at least one toy in wireless communication with the computer system, the computer game including a plurality of game objects, and the plurality of game objects includes the at least one display object and the at least one toy.

Further in accordance with a preferred embodiment of the present invention the at least one toy is operative to transmit toy identification data to the computer system, and the computer system is operative to adapt a mode of operation of the computer game based, at least in part, on the toy identification data.

The computer system may include a plurality of computers.

Additionally in accordance with a preferred embodiment of the present invention the first transmission includes computer identification data and the second transmission includes computer identification data.

There is also provided in accordance with a preferred embodiment of the present invention a data transmission apparatus including first wireless apparatus including musical instrument data interface (MIDI) apparatus operative to receive and transmit MIDI data between a first wireless and a first MIDI device and second wireless apparatus including MIDI apparatus operative to receive and transmit MIDI data between a second wireless and a second MIDI device, the first wireless apparatus is operative to transmit MIDI data including data received from the first MIDI device to the second wireless apparatus, and to transmit MIDI data including data received from the second wireless apparatus to the first MIDI device, and the second wireless apparatus is operative to transmit MIDI data including data received from the second MIDI device to the first wireless apparatus, and to transmit MIDI data including data received from the first wireless apparatus to the second MIDI device.

Further in accordance with a preferred embodiment of the present invention the second wireless apparatus includes a plurality of wirelesses each respectively associated with one of the plurality of MIDI devices, and each of the second plurality of wirelesses is operative to transmit MIDI data including data received from the associated MIDI device to the first wireless apparatus, and to transmit MIDI data including data received from the first wireless apparatus to the associated MIDI device.

The first MIDI device may include a computer, while the second MIDI device may include a toy.

Additionally in accordance with a preferred embodiment of the present invention the first wireless apparatus also includes analog interface apparatus operative to receive and transmit analog signals between the first wireless and a first analog device, and the second wireless apparatus also includes analog interface apparatus operative to receive and transmit analog signals between the second wireless and a second analog device, and the first wireless apparatus is also operative to transmit analog signals including signals received from the first analog device to the second wireless apparatus,

and to transmit analog signal including signals received from the second wireless apparatus to the first analog device, and the second wireless apparatus is also operative to transmit analog signals including signals received from the second analog device to the first wireless apparatus, and to transmit analog signals including data received from the first wireless apparatus to the second analog device.

There is also provided in accordance with another preferred embodiment of the present invention a method for generating control instructions for a computer controlled toy system, the method includes selecting a toy, selecting at least one command from among a plurality of commands associated with the toy, and generating control instructions for the toy including the at least one command.

Further in accordance with a preferred embodiment of the present invention the step of selecting at least one command includes choosing a command, and specifying at least one control parameter associated with the chosen command.

Still further in accordance with a preferred embodiment of the present invention the at least one control parameter includes at least one condition depending on a result of a previous command.

Additionally in accordance with a preferred embodiment of the present invention at least one of the steps of selecting a toy and the step of selecting at least one command includes utilizing a graphical user interface.

Still further in accordance with a preferred embodiment of the present invention the previous command includes a previous command associated with a second toy.

Additionally in accordance with a preferred embodiment of the present invention the at least one control parameter includes an execution condition controlling execution of the command.

The execution condition may include a time at which to perform the command and/or a time at which to cease performing the command. The execution condition may also include a status of the toy.

Additionally in accordance with a preferred embodiment of the present invention the at least one control parameter includes a command modifier modifying execution of the command.

Still further in accordance with a preferred embodiment of the present invention the at least one control parameter includes a condition dependent on a future event.

Additionally in accordance with a preferred embodiment of the present invention the at least one command includes a command to cancel a previous command.

There is also provided for in accordance with a preferred embodiment of the present invention a signal transmission apparatus for use in conjunction with a computer, the apparatus including wireless transmission apparatus; and signal processing apparatus including at least one of the following analog/digital sound conversion apparatus operative to convert analog sound signals to digital sound signals, to convert digital sound signals to analog sound signals, and to transmit the signals between the computer and a sound device using the wireless transmission apparatus; a peripheral control interface operative to transmit control signals between the computer and a peripheral device using the wireless transmission apparatus; and a MIDI interface operative to transmit MIDI signals between the computer and a MIDI device using the wireless transmission apparatus.

There is also provided in accordance with another preferred embodiment of the present invention a computer system including a computer, and a sound card operatively attached to the computer and having a MIDI connector and at least one analog connector, wherein the computer is operative to transmit digital signals by means of the MIDI connector and to transmit analog signals by means of the at least one analog connector.

Further in accordance with a preferred embodiment of the present invention the computer is also operative to receive digital signals by means of the MIDI connector and to receive analog signals by means of the at least one analog connector.

It is also noted that throughout the specification and claims the term "radio" includes all forms of "wireless" communication.

The term "fanciful figure" and the like, as used herein, is intended to include figures which may or may not be based on fact and which are made or designed in a curious, intricate or imaginative way.

The term "simultaneous play" and the like indicates that several players are playing a game or games at a given moment although the players may or may not have started playing the game or games at the same time and may or may not finish playing the game or games at the same time.

The term "crowd-accommodating area" is intended to include areas capable of accommodating hundreds and preferably thousands or even tens of thousands of visitors.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated from the following detailed description, taken in conjunction with the drawings and the attached Appendix A in which:

Figs. 1 - 32C illustrate a toy system for use in conjunction with a computer system wherein:

Fig. 1A is a partly pictorial, partly block diagram illustration of a computer control system including a toy, constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 1B is a partly pictorial, partly block diagram illustration a preferred implementation of the toy 122 of Fig. 1A;

Fig. 1C is a partly pictorial, partly block diagram illustration of a computer control system including a toy, constructed and operative in accordance with an alternative preferred embodiment of the present invention;

Figs. 2A - 2C are simplified pictorial illustrations of a portion of the system of Fig. 1A in use;

Fig. 3 is a simplified block diagram of a preferred implementation of the computer radio interface 110 of Fig. 1A;

Fig. 4 is a more detailed block diagram of the computer radio interface 110 of Fig. 3;

Figs. 5A - 5D taken together comprise a schematic diagram of the apparatus of Fig. 4;

Fig. 5E is a schematic diagram of an alternative implementation of the apparatus of Fig. 5D;

Fig. 6 is a simplified block diagram of a preferred implementation of the toy control device 130 of Fig. 1A;

Figs. 7A - 7F, taken together with either Fig. 5D or Fig. 5E, comprise a schematic diagram of the apparatus of Fig. 6;

Fig. 8A is a simplified flowchart illustration of a preferred method for receiving radio signals, executing commands comprised therein, and sending radio signals, within the toy control device 130 of Fig. 1A;

Figs. 8B - 8T, taken together, comprise a simplified flowchart illustration of a preferred implementation of the method of Fig. 8A;

Fig. 9A is a simplified flowchart illustration of a preferred method for receiving MIDI signals, receiving radio signals, executing commands comprised therein, sending radio signals, and sending MIDI signals, within the computer radio interface 110 of Fig. 1A;

Figs. 9B - 9N, taken together with Figs. 8D - 8M, comprise a simplified flowchart illustration of a preferred implementation of the method of Fig. 9A;

Figs. 10A - 10C are simplified pictorial illustrations of a signal transmitted between the computer radio interface 110 and the toy control device 130 of Fig. 1A;

Fig. 11 is a simplified flowchart illustration of a preferred method for generating control instructions for the apparatus of Fig. 1A;

Figs. 12A - 12C are pictorial illustrations of a preferred implementation of a graphical user interface implementation of the method of Fig. 11;

Fig. 13 is a block diagram of a first sub-unit of a multi-port multi-channel implementation of the computer radio interface 110 of Fig. 1A, which sub-unit resides within computer 100 of Fig. 1A;

Fig. 14 is a block diagram of a second sub-unit of a multi-port multi-channel implementation of the computer radio interface 110 of Fig. 1A, which sub-unit complements the apparatus of Fig. 13 and resides exteriorly to computer 100 of Fig. 1A;

Figs. 15A - 15E, taken together, form a detailed electronic schematic diagram of the toy control device of Fig. 6, suitable for the multi-channel implementation of Figs. 13 and 14;

Fig. 16 is a simplified flowchart illustration of a preferred method by which a computer selects a control channel pair in anticipation of a toy becoming available and starts a game-defining communication over the control channel each time both a toy and a transceiver of the computer radio interface are available;

Fig. 17 is a simplified flowchart illustration of a preferred method for implementing the "select control channel pair" step of Fig. 16;

Fig. 18A is a simplified flowchart illustration of a preferred method for implementing the "select information communication channel pair" step of Fig. 16;

Fig. 18B is a simplified flowchart illustration of a preferred method for performing the "locate computer" step of Fig. 18A;

Fig. 19 is a simplified flowchart illustration of a preferred method of operation of the toy control device 130;

Fig. 20 is a simplified illustration of a remote game server in association with a wireless computer controlled toy system which may include a network computer;

Fig. 21 is a simplified flowchart illustration of the operation of the computer or of the network computer of Fig. 20, when operating in conjunction with the remote server;

Fig. 22 is a simplified flowchart illustration of the operation of the remote game server of Fig. 20;

Fig. 23 is a semi-pictorial semi-block diagram illustration of a wireless computer controlled toy system including a proximity detection subsystem operative to detect proximity between the toy and the computer;

Figs. 24A - 24E, taken together, form a detailed electronic schematic diagram of a multi-channel implementation of the computer radio interface 110 of Fig. 3 which is similar to the detailed electronic schematic diagrams of Figs. 5A - 5D except for being multi-channel, therefore capable of supporting full duplex applications, rather than single-channel;

Figs. 25A - 25E, taken together, form a detailed schematic illustration of a computer radio interface which connects to a serial port of a computer rather than to the sound board of the computer;

Figs. 26A - 26D, taken together, form a detailed schematic illustration of a computer radio interface which connects to a parallel port of a computer rather than to the sound board of the computer.;

Figs. 27A - 27J are preferred flowchart illustrations of a preferred radio coding technique which is an alternative to the radio coding technique described above with reference to Figs. 8E, 8G - 8M and 10A - C;

Figs. 28A - 28K, taken together, form a detailed electronic schematic diagram of the multi-port multi-channel computer radio interface sub-unit of Fig. 13;

Figs. 29A - 29I, taken together, form a detailed electronic schematic diagram of the multi-port multi-channel computer radio interface sub-unit of Fig. 14;

Fig. 30 is a partly pictorial, partly block diagram illustration of a computer control system including a toy, constructed and operative in accordance with a further preferred embodiment of the present invention;

Fig. 31 is a block diagram is a simplified block diagram illustrating the combination of the computer radio interface and the toy control device as used in the embodiment of Fig. 30; and

Figs. 32A, 32B and 32C taken together form a simplified block diagram of the EPLD chip of Fig. 28H; and

Figs. 33 - 81 illustrates embodiments of the toy system of Figs. 1 - 32C wherein:

Figs. 33A - 33C, taken together, form a simplified pictorial illustration of an amusement park system constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 34 is a simplified pictorial illustration of a first state of some of the elements of an amusement park system constructed and operative in accordance with another preferred embodiment of the present invention;

Fig. 35 is a simplified pictorial illustration of a second state of the amusement park system of Fig. 34;

Fig. 36 is a simplified pictorial illustration of one of the elements of the amusement park system of Figs. 34 - 35;

Fig. 37 is a simplified flowchart illustration of a preferred method of operation by which the central amusement park controller of Fig. 33 performs each of a multiplicity of node control tasks for each of a corresponding multiplicity of nodes;

Fig. 38 is a simplified flowchart illustration of a preferred method for performing the "visitor localization" step of Fig. 37;

Fig. 39 is a simplified flowchart illustration of a preferred method for performing the "new visitor welcoming" step of Fig. 37;

Fig. 40 is a simplified flowchart illustration of a preferred method for performing the "launch execution of next script item" step of Fig. 37;

Fig. 41 is a simplified flowchart illustration of a preferred method for performing the "analyze conditions" step of Fig. 40;

Fig. 42 is a simplified flowchart illustration of a preferred method for performing the "perform action set" step of Fig. 40;

Figs. 43A - 43C, taken together, form a diagram of a data structure typically residing in the central amusement park controller 2010 and suitable for storing information regarding visitors to the amusement park;

Fig. 44 is a bubble diagram of a "find lost person" game;

Fig. 45 is a diagram of two "Visitor Record" data structures of Fig. 43A storing information regarding two respective visitors playing the "find lost person" game of Fig. 44, of which one is the lost person and the other is the seeker;

Fig. 46A is a diagram of three "Game State Record" data structures of Figs. 43A - 43C storing information regarding three of the four respective game states within the "find lost person" game of Fig. 44;

Fig. 46B is a diagram of the fourth "Game State Record" data structure of Figs. 43A - 43C which stores information regarding the fourth of the four respective game states within the "find lost person" game of Fig. 44;

Fig. 47 is a diagram of a "Node Record" data structure of Figs. 43A - 43C storing information regarding a node which is operating within the "find lost person" game of Fig. 44;

Fig. 48 is a simplified flowchart illustration of a preferred chain of events which typically occur in setting up for and playing the "find lost person" game of Figs. 44 - 47;

Fig. 49 is a bubble diagram of a game for groups, "zoo-keeper", in which powers or credits are accumulated;

Figs. 50A - 50E, taken together, form a diagram of 2010 "Visitor Record" data structures of Figs. 43A - 43C storing information regarding seven visitors playing the group game of Fig. 48, the visit being arranged into two sub-groups, the two sub-groups defining a "main group" or "parent group" comprising both of them, wherein:

Fig. 50A comprises two "Visitor Record" data structures representing the main group and one of the sub-groups respectively;

Fig. 50B comprises two "Visitor Record" data structures representing the other of the sub- groups and one of the visitors respectively;

Figs. 50C - 50E each comprise two "Visitor Record" data structures representing two of the visitors, respectively;

Fig. 51 is a diagram of a "Node Record" data structure of Figs. 43A - 43C storing information regarding a node, "deer", which is operating within the group game of Fig. 48;

Fig. 52 is a diagram of a "Game State Record" data structure of Figs. 43A - 43C storing information regarding one of the game states, "feed bear", within the group game of Figs. 49 - 51;

Fig. 53 is a diagram of another "Game State Record" data structure of Figs. 43A - 43C storing information regarding another of the game states, "feed deer", within the group game of Figs. 49 - 51;

Figs. 54A - 54B are simplified flowchart illustrations of different aspects of a preferred chain of events including some of the events which typically occur in playing the "zoo-keeper" game of Figs. 49 - 53;

Fig. 55 is a bubble diagram of a game for an individual, "tree-quiz", in which a prize or other token is dispensed to the individual player by one of the nodes in the amusement park;

Figs. 56A - 56B, taken together, form a diagram of one alternative "Game State Record" data structure of Figs. 43A - 43C, storing information regarding one of the game states, "ask question", within the individual game of Fig. 55;

Figs. 56A and 56C, taken together, form a diagram of another alternative "Game State Record" data structure of Figs. 43A - 43C, storing information regarding one of the game states, "ask question", within the individual game of Fig. 55;

Fig. 57 is a diagram of two "Game State Record" data structures of Figs. 43A - 43C storing information regarding two additional game states, "record answer" and "give present", within the individual game of Fig. 55;

Fig. 58 is a diagram of a "Visitor Record" data structure of Figs. 43A - 43C storing information regarding an individual visitor playing the individual game of Figs. 55 - 57;

Fig. 59 is a diagram of a "Node Record" data structure of Figs. 43A - 43C storing information regarding two nodes, "tree" and "clown", which are operating within the individual game of Figs. 55 - 58;

Fig. 60A - 60B, taken together, form a simplified flowchart illustration of a preferred chain of events including the events which typically occur in playing the "tree-quiz" game of Figs. 55 - 59;

Fig. 61 is a bubble diagram of a game for an individual, "common encounters", in which a player makes a common comment or complaint or asks a common question such as "where are the restrooms" of one of the nodes in the amusement park and a suitable answer is provided to the individual player by that node;

Fig. 62 is a diagram of a "Game State Record" data structure element of Figs. 43A - 43C storing information regarding a game state, "ask question", of the "common encounters" game of Fig. 61;

Fig. 63A is a diagram of a "Game State Record" data structure element of Figs. 43A - 43C storing information regarding a game state, "analyze", of the "common encounters" game of Fig. 61;

Fig. 63B is a diagram of two "Game State Record" data structure elements of Figs. 43A - 43C storing information regarding two respective game states, "provide information" and "record", of the "common encounters" game of Fig. 61;

Fig. 64 is a diagram of a "Node Record" data structure of Figs. 43A - 43C storing information regarding a node, "moving dog" 2140, which is operating within the game of Figs. 61 - 66;

Figs. 65A - 65B, taken together, form a play record data structure of an example of a play record operative to store oral and/or textual information to be played (i.e. orally presented) to a user who has asked for directions to the restrooms;

Fig. 66 is a diagram of 2 "Frequent inquiry record" data structures of Figs. 43A - 43C storing information regarding two frequently posed inquiries: "where is the bathroom" and "please clean the bathroom";

Fig. 67A is a simplified flowchart illustration of a process that suspends a game;

Fig. 67B is a simplified flowchart illustration of a process that resumes a game;

Fig. 68A is a simplified flowchart illustration of a first preferred chain of events including all operations performed by the central node controller 2010, on behalf of a node approached by a player in the course of playing a "common encounters" game of Figs. 62 - 66 provided in accordance with a first preferred embodiment of the present invention;

Fig. 68B is a simplified flowchart illustration of a preferred method by which the central node controller effects the "analyze keywords" step of Fig. 68A;

Fig. 68C is a simplified flowchart illustration of the "compute total weights" step of Fig. 68B;

Fig. 69 is a simplified flowchart illustration of a second preferred chain of events including all operations performed by the central node controller 2010, on behalf of a node approached by a player in the course of playing a "common encounters" game of Figs. 62 - 66 provided in accordance with a second preferred embodiment of the present invention;

Fig. 70 is a simplified flowchart illustration of a preferred method for playing speech and simultaneously appropriately moving at least one body part so as to provide an appropriate physical expression or demeanor;

Fig. 71 is a simplified block diagram of a preferred hardware implementation of node control device 2214 of Fig. 36 which is suitable for a node whose connection to the central node controller comprises a wireless connection;

Fig. 72 is a simplified block diagram of a first computer board which, in conjunction with the computer board of Fig. 73, comprises a preferred implementation of the computer-node interface of the central node controller of Fig. 33B, for wireless applications;

Fig. 73 is a simplified block diagram of a second computer board which, in conjunction with the computer board of Fig. 72, comprises a preferred implementation of the computer-node interface of the central node controller of Fig. 33B, for wireless applications;

Fig. 74 is a simplified block diagram of a preferred hardware implementation of node control device 2214 of Fig. 36 which is suitable for a node whose connection to the central node controller comprises a cable connection;

Fig. 75 is a simplified block diagram of circuitry which comprises a preferred implementation of the computer-node interface of the central node controller of Fig. 33B, for cable applications in which nodes are connected via cables to the central node controller;

Fig. 76 is a pictorial illustration of a node which is operative to dispense an item of value to a player and specifically to print coupons and dispense them to players in accordance with control instructions, arriving from the central node controller, which determine differential entitlement of different players;

Fig. 77 is a pictorial illustration of a node which is operative to interact physically with a player and specifically to sense at least one physical, non-verbal aspect of a player's performance of a task which typically forms part of a game and to provide an evaluation thereof to the central node controller; and

Fig. 78 is a pictorial illustration of a plurality of nodes participating in various games played by a plurality of visitors wherein at least some of the nodes participate in more than one simultaneously ongoing games, and wherein, for at least some nodes, there is a queue of visitors including a first visitor playing a first game and a second visitor playing a second game;

Fig. 79 is a simplified flowchart illustration of a preferred method for computing the Direction function stored in the Begin field of the Play Record of Fig. 65A, as a function of a pointing node (Parameter 1) and a target node (Parameter 2), wherein Direction represents the direction in which a visitor must proceed in order to move from the pointing node to the target node;

Figs. 80A - 80C, taken together, form a simplified flowchart illustration of a preferred method by which a node can suggest a new game to a visitor who approaches the node and who is not playing any game; and

Fig. 81 is a simplified flowchart illustration of a preferred procedure followed by a human attendant servicing an entrance to the park and for registering new visitors to the park.

Appendix A is a detailed description of and preferred elements of one alternative embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference is now made to Fig. 1A which is a partly pictorial, partly block diagram illustration of a computer control system including a toy, constructed and operative in accordance with a preferred embodiment of the present invention. The system of Fig. 1A comprises a computer 100, which may be any suitable computer such as, for example, an IBM-compatible personal computer. The computer 100 is equipped with a screen 105. The computer 100 is preferably equipped with a sound card such as, for example, a Sound Blaster Pro card commercially available from Creative Labs, Inc., 1901 McCarthy Boulevard, Milpitas CA 95035 or from Creative Technology Ltd., 67 Ayer Rajah Crescent #03-18, Singapore, 0513; a hard disk; and, optionally, a CD-ROM drive.

The computer 100 is equipped with a computer radio interface 110 operative to transmit signals via wireless transmission based on commands received from the computer 100 and, in a preferred embodiment of the present invention, also to receive signals transmitted elsewhere via wireless transmission and to deliver the signals to the computer 100. Typically, commands transmitted from the computer 100 to the computer radio interface 110 are transmitted via both analog signals and digital signals,

with the digital signals typically being transmitted by way of a MIDI port. Transmission of the analog and digital signals is described below with reference to Fig. 3.

The transmitted signal may be an analog signal or a digital signal. The received signal may also be an analog signal or a digital signal. Each signal typically comprises a message. A preferred implementation of the computer radio interface 110 is described below with reference to Fig. 3.

The system of Fig. 1A also comprises one or more toys 120. The system of Fig. 1A comprises a plurality of toys, namely three toys 122, 124, and 126 but it is appreciated that, alternatively, either one toy only or a large plurality of toys may be used.

Reference is now additionally made to Fig. 1B, which is a partly pictorial, partly block diagram illustration of the toy 122 of Fig. 1A.

Each toy 120 comprises a power source 125, such as a battery or a connection to line power. Each toy 120 also comprises a toy control device 130, operative to receive a wireless signal transmitted by the computer 100 and to cause each toy 120 to perform an action based on the received signal. The received signal may be, as explained above, an analog signal or a digital signal. A preferred implementation of the toy control device 130 is described below with reference to Fig. 6.

Each toy 120 preferably comprises a plurality of input devices 140 and output devices 150, as seen in Fig. 1B. The input devices 140 may comprise, for example on or more of the following: a microphone 141; a microswitch sensor 142; a touch sensor (not shown in Fig. 1B); a light sensor (not shown in Fig. 1B); a movement sensor 143, which may be, for example, a tilt sensor or an acceleration sensor. Appropriate commercially available input devices include the following: position sensors available from Hamlin Inc., 612 East Lake Street, Lake Mills, WI 53551, USA; motion and vibration sensors available from Comus International, 263 Hillside Avenue, Nutley, New Jersey 07110, USA; temperature, shock, and magnetic sensors available from Murata Electronics Ltd., Hampshire, England; and switches available from C & K Components Inc., 15 Riverdale Avenue, Newton, MA 02058-1082, USA or from Micro Switch Inc., a division of Honeywell, USA. The output devices 150 may comprise, for example, one or more of the following: a speaker 151; a light 152; a solenoid 153 which may be

operative to move a portion of the toy; a motor, such as a stepping motor, operative to move a portion of the toy or all of the toy (not shown in Fig. 1B). Appropriate commercially available output devices include the following: DC motors available from Alkatel (dunkermotoren), Postfach 1240, D-7823, Bonndorf/Schwarzald, Germany; stepping motors and miniature motors available from Haydon Switch and Instruments, Inc. (HSI), 1500 Meriden Road, Waterbury, CT, USA; and DC solenoids available from Communications Instruments, Inc., P.O. Box 520, Fairview, North Carolina 28730, USA.

Examples of actions which the toy may perform include the following: move a portion of the toy; move the entire toy; or produce a sound, which may comprise one or more of the following: a recorded sound, a synthesized sound, music including recorded music or synthesized music, speech including recorded speech or synthesized speech.

The received signal may comprise a condition governing the action as, for example, the duration of the action, or the number of repetitions of the action.

Typically, the portion of the received signal comprising a message comprising a command to perform a specific action as, for example, to produce a sound with a given duration, comprises a digital signal. The portion of the received signal comprising a sound, for example, typically comprises an analog signal. Alternatively, in a preferred embodiment of the present invention, the portion of the received signal comprising a sound, including music, may comprise a digital signal, typically a signal comprising MIDI data.

The action the toy may perform also includes reacting to signals transmitted by another toy, such as, for example, playing sound that the other toy is monitoring and transmitting.

In a preferred embodiment of the present invention, the toy control device 130 is also operative to transmit a signal intended for the computer 100, to be received by the computer radio interface 110. In this embodiment, the computer radio interface 110 is preferably also operative to poll the toy control device 130, that is, transmit a signal comprising a request that the toy control device 130 transmit a signal to the

computer radio interface 110. It is appreciated that polling is particularly preferred in the case where there are a plurality of toys having a plurality of toy control devices 130.

The signal transmitted by the toy control device 130 may comprise one or more of the following: sound, typically sound captured by a microphone input device 141; status of sensor input devices 140 as, for example, light sensors or micro switch; an indication of low power in the power source 125; or information identifying the toy.

It is appreciated that a sound signal transmitted by the device 130 may also include speech. The computer system is operative to perform a speech recognition operation on the speech signals.

Appropriate commercially available software for speech recognition is available from companies such as: Stylus Innovation Inc., One Kendall Square, Building 300, Cambridge, MA 02139, USA; A&G Graphics Interface, USA, Telephone No. (617) 492-0120, Telefax No. (617) 427-3625; "Dragon Dictate For Windows", available from Dragon Systems Inc., 320 Nevada Street, MA. 02160, USA, and "SDK" available from Lernout & Hauspie Speech Products, Sint-Krispijnstraat 7, 8900 Leper, Belgium.

The signal from the radio control interface 110 may also comprise, for example, one or more of the following: a request to ignore input from one or more input devices 140; a request to activate one or more input devices 140 or to stop ignoring input from one or more input devices 140; a request to report the status of one or more input devices 140; a request to store data received from one or more input devices 140, typically by latching a transition in the state of one or more input devices 140, until a future time when another signal from the radio control interface 110 requests the toy control device 130 to transmit a signal comprising the stored data received from the one or more input devices 140; or a request to transmit analog data, typically comprising sound, typically for a specified period of time.

Typically, all signals transmitted in both directions between the computer radio interface 110 and the toy control device 130 include information identifying the toy.

Reference is now made to Fig. 1C, which is a partly pictorial, partly block diagram illustration of a computer control system including a toy, constructed and operative in accordance with an alternative preferred embodiment of the present

invention. The system of Fig. 1C comprises two computers 100. It is appreciated that, in general, a plurality of computers 100 may be used. In the implementation of Fig. 1C, all signals transmitted in both directions between the computer radio interface 110 and the toy control device 130 typically include information identifying the computer.

The operation of the system of Fig. 1A is now briefly described. Typically, the computer 100 runs software comprising a computer game, typically a game including at least one animated character. Alternatively, the software may comprise educational software or any other interactive software including at least one animated object. As used herein, the term "animated object" includes any object which may be depicted on the computer screen 105 and which interacts with the user of the computer via input to and output from the computer. An animated object may be any object depicted on the screen such as, for example: a doll; an action figure; a toy, such as, for example, an activity toy, a vehicle, or a ride-on vehicle; a drawing board or sketch board; or a household object such as, for example, a clock, a lamp, a chamber pot, or an item of furniture.

Reference is now additionally made to Figs 2A - 2C, which depict a portion of the system of Fig. 1A in use. The apparatus of Fig. 2A comprises the computer screen 105 of Fig. 1A. On the computer screen are depicted animated objects 160 and 165.

Fig. 2B depicts the situation after the toy 122 has been brought into range of the computer radio interface 110 of Fig. 1A, typically into the same room therewith. Preferably, the toy 122 corresponds to the animated object 160. For example, in Fig. 2B the toy 122 and the animated object 160, shown in Fig. 2A, are both a teddy bear. The apparatus of Fig. 2B comprises the computer screen 105, on which is depicted the animated object 165. The apparatus of Fig. 2B also comprises the toy 122. The computer 100, having received a message via the computer radio interface 110, from the toy 122, no longer displays the animated object 160 corresponding to the toy 122. The functions of the animated object 160 are now performed through the toy 122, under control of the computer 100 through the computer radio interface 110 and the toy control device 130.

Fig. 2C depicts the situation after the toy 126 has also been brought into range of the computer radio interface 110 of Fig. 1A, typically into the same room

therewith. Preferably, the toy 126 corresponds to the animated object 165. For example, in Fig. 2C the toy 126 and the animated object 165, shown in Figs. 2A and 2B, are both a clock. The apparatus of Fig. 2C comprises the computer screen 105, on which no animated objects are depicted.

The apparatus of Fig. 2C also comprises the toy 126. The computer 100, having received a message via the computer radio interface 110 from the toy 126, no longer displays the animated object 165 corresponding to the toy 126. The functions of the animated object 165 are now performed through the toy 126, under control of the computer 100 through the computer radio interface 110 and the toy control device 130.

In Fig. 2A, the user interacts with the animated objects 160 and 165 on the computer screen, typically using conventional methods. In Fig. 2B the user also interacts with the toy 122, and in Fig. 2C typically with the toys 122 and 126, instead of interacting with the animated objects 160 and 165 respectively. It is appreciated that the user may interact with the toys 122 and 126 by moving the toys or parts of the toys; by speaking to the toys; by responding to movement of the toys which movement occurs in response to a signal received from the computer 100; by responding to a sound produced by the toys, which sound is produced in response to a signal received from the computer 100 and which may comprise music, speech, or another sound; or otherwise.

Reference is now made to Fig. 3 which is a simplified block diagram of a preferred embodiment of the computer radio interface 110 of Fig. 1A. The apparatus of Fig. 3 comprises the computer radio interface 110. The apparatus of Fig. 3 also comprises a sound card 190, as described above with reference to Fig. 1A. In Fig. 3, the connections between the computer radio interface 110 and the sound card 190 are shown.

The computer radio interface 110 comprises a DC unit 200 which is fed with power through a MIDI interface 210 from a sound card MIDI interface 194, and the following interfaces: a MIDI interface 210 which connects to the sound card MIDI interface 194; an audio interface 220 which connects to an audio interface 192 of the sound card 190; and a secondary audio interface 230 which preferably connects to a stereo sound system for producing high quality sound under control of software running on the computer 100 (not shown).

The apparatus of Fig. 3 also comprises an antenna 240, which is operative to send and receive signals between the computer radio interface 110 and one or more toy control devices 130.

Fig. 4 is a more detailed block diagram of the computer radio interface 110 of Fig. 3. The apparatus of Fig. 4 comprises the DC unit 200, the MIDI interface 210, the audio interface 220, and the secondary audio interface 230. The apparatus of Fig. 4 also comprises a multiplexer 240, a micro controller 250, a radio transceiver 260, a connection unit 270 connecting the radio transceiver 260 to the micro controller 250, and a comparator 280.

Reference is now made to Figs. 5A - 5D, which taken together comprise a schematic diagram of the apparatus of Fig. 4.

The following is a preferred parts list for the apparatus of Figs. 5A - 5C:

1. K1 Relay Dept, Idec, 1213 Elco Drive, Sunnyvale, Calif. 94089-2211, USA.
2. U1 8751 microcontroller, Intel Corporation, San Tomas 4, 2700 San Tomas Expressway, 2nd Floor, Santa Clara 95051, CA USA.
3. U2 CXO - 12MHZ (crystal oscillator),Raltron, 2315 N.W. 107th Avenue, Miami Florida 33172, USA.
4. U4 MC33174, Motorola, Phoenix, AZ, USA., Tel. No. (602) 897-5056.
5. Diodes 1N914, Motorola, Phoenix, AZ, USA. Tel. No. (602)897-5056.
6. Transistors 2N2222 and MPSA14, Motorola, Phoenix, AZ, USA. Tel. No.(602)897-5056.

The following is a preferred parts list for the apparatus of Fig. 5D:

1. U1 SILRAX-418-A UHF radio telemetry receive module, Ginsburg Electronic GmbH, Am Moosfeld 85, D-81829, Munchen, Germany.

Alternatively, U1 of Fig. 5D may be replaced by:

- U1 433.92MHz Receive Module Part No. 0927, available from CEL SALES LTD., Cel House, Unit 2, Block 6, Shenstone Trading Estate, Bromsgrove, Halesowen, West Midlands B36 3XB, UK.

2. U2 TXM-418-A low power UHF radio telemetry transmit module, Ginsburg Electronic GmbH, Am Moosfeld 85, D-1829, Munchen, Germany.

Alternatively, U2 of Fig. 5D may be replaced by:

U2 433.92 SIL FM Transmitter Module Part No, 5229, available from CEL SALES LTD., Cel House, Unit 2, Block 6, Shenstone Trading Estate, Bromsgrove, Halesowen, West Midlands B36 3XB UK.

Reference is now additionally made to Fig. 5E, which is a schematic diagram of an alternative implementation of the apparatus of Fig. 5D. The following is a preferred parts list for the apparatus of Fig. 5E:

1. U1 BIM-418-F low power UHF data transceiver module, Ginsburg Electronic GmbH, Am Moosfeld 85, D-81829, Munchen, Germany.

Alternate 1. U1 S20043 spread spectrum full duplex transceiver, AMI Semiconductors - American Microsystems, Inc., Idaho, USA.

Alternate 1. U1 SDT-300 synthesized transceiver, Circuit Design, Inc., Japan.

Alternatively, U1 may be replaced by:

U1 RY3GB021 RF 900Mhz units, available from SHARP ELECTRONIC COMPONENTS GROUP, 5700 Northwest, Pacific Rim Boulevard #20, Camas, Washington, USA.

U1 RY3GB100 RF Units For DECT, available from SHARP ELECTRONIC COMPONENTS GROUP 5700 Northwest, Pacific Rim Boulevard #20, Camas, Washington, USA.

In the parts list for Fig. 5E, one of item 1 or either of the alternate items 1 may be used for U1.

It is appreciated that the appropriate changes will have to be made to all the circuit boards for alternate embodiments of the apparatus.

The apparatus of Fig. 5E has similar functionality to the apparatus of Fig. 5D, but has higher bit rate transmission and reception capacity and is, for example, preferred when MIDI data is transmitted and received.

Figs. 5A - 5E are self-explanatory with regard to the above parts lists.

Reference is now made to Fig. 6 which is a simplified block diagram of a preferred embodiment of the toy control device 130 of Fig. 1A. The apparatus of Fig. 6 comprises a radio transceiver 260, similar to the radio transceiver 260 of Fig. 4. The apparatus of Fig. 6 also comprises a microcontroller 250 similar to the microcontroller 250 of Fig. 4.

The apparatus of Fig. 6 also comprises a digital input/output interface (digital I/O interface) 290, which is operative to provide an interface between the microcontroller 250 and a plurality of input and output devices which may be connected thereto such as, for example, four input device and four output devices. A preferred implementation of the digital I/O interface 290 is described in more detail below with reference to Fig. 7A - 7F.

The apparatus of Fig. 6 also comprises an analog input/output interface (analog I/O interface) 300 operatively connected to the radio transceiver 260, and operative to receive signals therefrom and to send signals thereto.

The apparatus of Fig. 6 also comprises a multiplexer 305 which is operative, in response to a signal from the microcontroller 250, to provide output to the analog I/O interface 300 only when analog signals are being transmitted by the radio transceiver 260, and to pass input from the analog I/O interface 300 only when such input is desired.

The apparatus of Fig. 6 also comprises input devices 140 and output devices 150. In Fig. 6, the input devices 140 comprise, by way of example, a tilt switch operatively connected to the digital I/O interface 290, and a microphone operatively connected to the analog I/O interface 300. It is appreciated that a wide variety of input devices 140 may be used.

In Fig. 6, the output devices 150 comprise, by way of example, a DC motor operatively connected to the digital I/O interface 290, and a speaker operatively connected to the analog I/O interface 300. It is appreciated that a wide variety of output devices 150 may be used.

The apparatus of Fig. 6 also comprises a DC control 310, a preferred implementation of which is described in more detail below with reference to Figs. 7A - 7F.

The apparatus of Fig. 6 also comprises a comparator 280, similar to the comparator 280 of Fig. 4.

The apparatus of Fig. 6 also comprises a power source 125, shown in Fig. 6 by way of example as batteries, operative to provide electrical power to the apparatus of Fig. 6 via the DC control 310.

Reference is now made to Figs. 7A - 7F which, taken together with either Fig. 5D or 5E, comprise a schematic diagram of the toy control device of Fig. 6. If the schematics of Fig. 5E is employed to implement the computer radio interface of Fig. 4, using RY3GB021 as U1 of Fig. 5E, then the same schematics of Fig. 5E are preferably employed to implement the toy control device of Fig. 6 except that RY3GH021 is used to implement U1 rather than RY3GB021.

The following is a preferred parts list for the apparatus of Figs. 7A - 7F:

1. U1 8751 microcontroller, Intel Corporation, San Tomas 4, 2700 San Tomas Expressway, 2nd Floor, Santa Clara 95051, CA USA.
2. U2 LM78L05, National Semiconductor, 2900 Semiconductor Drive, Santa Clara, CA. 95052, USA.
3. U3 CXO - 12MHz (crystal oscillator), Raltron, 2315 N.W. 107th Avenue, Miami, FL. 33172, USA.
4. U4 MC33174, Motorola, Phoenix, AZ, USA. Tel. No. (602) 897-5056.
5. U5 MC34119, Motorola, Phoenix, AZ, USA. Tel. No. (602) 897-5056.
6. U6 4066, Motorola, Phoenix, AZ, USA. Tel. No. (602) 897-5056.
7. Diode 1N914, 1N4005, Motorola, Phoenix, AZ, USA. Tel. No. (602) 897-5056.
8. Transistor 2N2222, 2N3906, Motorola, Phoenix, AZ, USA. Tel. No. (602) 897-5056.
9. Transistors 2N2907 and MPSA14, Motorola, Phoenix, AZ, USA. Tel. No. (602) 897-5056.

Figs. 7A - 7F are self-explanatory with reference to the above parts list.

As stated above with reference to Fig. 1A, the signals transmitted between the computer radio interface 110 and the toy control device 130 may be either analog signals or digital signals. In the case of digital signals, the digital signals preferably comprise a plurality of predefined messages, known to both the computer 100 and to the toy control device 130.

Each message sent by the computer radio interface 110 to the toy control device 130 comprises an indication of the intended recipient of the message. Each message sent by the toy control device 130 to the computer radio interface 110 comprises an indication of the sender of the message.

In the embodiment of Fig. 1C described above, messages also comprise the following:

each message sent by the computer radio interface 110 to the toy control device 130 comprises an indication of the sender of the message; and

each message sent by the toy control device 130 to the computer radio interface 110 comprises an indication of the intended recipient of the message.

A preferred set of predefined messages is as follows:

COMMAND STRUCTURE

| byte 0 | byte 1 | byte 2 | byte 3 | byte 4 | byte 5 | byte 6 | byte 7 | byte 8 | byte 9 |
|--------|-----------|----------------|----------------|----------------|------------|------------|------------|------------|--------|
| Head | PC add | Unit # A-sb | Unit # B-sb | Unit # C-sb | CMD msb | CMD lsb | - 8 bits - | - 8 bits - | CRC |
| | | | | | | | | | |
| 8 bit | 2 bit | 6 bit | 8 bit | 8 bit | 8 bit | 8 bit | 4 bit | 4 bit | 8 bits |

COMMANDS LIST

From the Computer to the Toy control device.

A. OUTPUT COMMANDS**SET_IO_TO_DATA**

| byte 0 | byte 1 | byte 2 | byte 3 | byte 4 | byte 5 | byte 6 | byte 7 | byte 8 | byte 9 |
|--------|-----------|----------------|----------------|----------------|------------|------------|------------|------------|--------|
| Head | PC add | Unit # A-sb | Unit # B-sb | Unit # C-sb | CMD msb | CMD lsb | - 8 bits - | - 8 bits - | CRC |
| | | | | | | | | | |
| 8 bit | 2 bit | 6 bit | 8 bit | 8 bit | 8 bit | 8 bit | 4 bit | 4 bit | 8 bits |
| 01 | P | 00 | 00 | A | 00 | 01 | 00 | D | x |

Set Toy control device output pin to a digital level D.

P: Computer address 00-03 H
 A: unit address - 00-FF H
 IO: i/o number - 00-03 H
 D: Data- 00-01 H

Example

1. 01 00 00 05 00 01 03 01 00 00 set io 3 to "1"
2. 01 00 00 05 00 01 03 00 00 00 set io 3 to "0"

CHANGE_IO_FOR_TIME

| byte 0 | byte 1 | byte 2 | byte 3 | byte 4 | byte 5 | byte 6 | byte 7 | byte 8 | byte 9 |
|--------|-----------|----------------|----------------|----------------|------------|------------|----------------------|----------------------|----------------------|
| Head | PC add | Unit # A-sb | Unit # B-sb | Unit # C-sb | CMD msb | CMD lsb | - 8 bits - | - 8 bits - | CRC |
| 8 bit | 2 bit | 6 bit | 8 bit | 8 bit | 8 bit | | Dat1 msb 4 bit | Dat2 msb 4 bit | Dat3 msb 4 bit |
| 01 | P | 00 | 00 | A | 00 | 02 | 00 | IO | D |
| | | | | | | | 00 | 00 | T1 |
| | | | | | | | 00 | 00 | T2 |
| | | | | | | | 00 | 00 | 8 bits |

Change Toy control device output pin to D for a period of time and then return to previous state.

- P: Computer address 00-03 11
- A: unit address - 00-FF 11
- IO: i/o number - 00-03 11
- T1,T2: time - 00-FF 11
- D: Data- 00-01 11

example:

- 1. 01 00 00 05 00 02 03 05 00 00 set io 3 to "1" for 5 seconds

B. INPUT COMMANDS

SEND_STATUS_OF_SENSORS

| byte 0 | byte 1 | byte 2 | byte 3 | byte 4 | byte 5 | byte 6 | byte 7 | byte 8 | byte 9 |
|--------|-----------|----------------|----------------|----------------|------------|------------|----------------------|----------------------|--------|
| Head | PC add | Unit # A-sb | Unit # B-sb | Unit # C-sb | CMD msb | CMD lsb | - 8 bits - | - 8 bits - | CRC |
| | | | | | | | | | |
| 8 bit | 2 bit | 6 bit | 8 bit | 8 bit | 8 bit | 8 bit | Dat1 msb 4 bit | Dat1 lsb 4 bit | 8 bits |
| 01 | P | 00 | 00 | A | 01 | 00 | x | x | |
| | | | | | | | Dat2 msb 4 bit | Dat2 lsb 4 bit | |
| | | | | | | | x | x | |
| | | | | | | | Dat3 msb 4 bit | Dat3 lsb 4 bit | |
| | | | | | | | x | x | |

send the Toy control device status of all sensors.

38

P: Computer address 00-03 11
A: unit address - 00-FF 11

example:

1. 01 00 00 05 01 00 00 00 00 00 send current status of sensors

SENSORS_SCAN_MODE_ON

| byte 0 | byte 1 | byte 2 | byte 3 | byte 4 | byte 5 | byte 6 | byte 7 | byte 8 | byte 9 |
|--------|--------|-------------|-------------|-------------|---------|---------|----------------|----------------|--------|
| Head | PC add | Unit # A-sb | Unit # B-sb | Unit # C-sb | CMD msb | CMD lsb | - 8 bits - | - 8 bits - | CRC |
| | | | | | | | | | |
| 8 bit | 2 bit | 6 bit | 8 bit | 8 bit | 8 bit | 8 bit | Dat1 msb 4 bit | Dat1 lsb 4 bit | 8 bits |
| 01 | P | 00 | 00 | A | 01 | 01 | x | x | x |

Start scanning the Toy control device sensors, and if one of them is closed (pressed to '0'), send back an ack.

P: Computer address 00-03 11
A: unit address - 00-FF 11

39
example:

1. 01 00 00 05 01 01 00 00 00 00 scan mode of sensors ON

SENSORS_SCAN_MODE_ON_ONCE

| byte 0 | byte 1 | byte 2 | byte 3 | byte 4 | byte 5 | byte 6 | byte 7 | byte 8 | byte 9 |
|--------|-----------|----------------|----------------|----------------|------------|------------|---------------|---------------|--------|
| Head | PC add | Unit # A-sb | Unit # B-sb | Unit # C-sb | CMD msb | CMD lsb | - 8 bits - | - 8 bits - | CRC |
| 8 bit | 2 bit | 6 bit | 8 bit | 8 bit | 8 bit | 8 bit | Dat1 msb | Dat1 lsb | |
| 01 | P | 00 | 00 | A | 01 | 02 | Dat2 msb | Dat2 lsb | |
| | | | | | | | Dat3 msb | Dat3 lsb | |
| | | | | | | | 4 bit | 4 bit | 8 bits |
| | | | | | | | x | x | |
| | | | | | | | x | x | |

Start scanning the Toy control device sensors, and if one of them is closed (pressed to '0'), send back an ack, then disable scanning the sensors.

P: Computer address
40 unit address -

00-03 II
00-FF II

1. 01 00 00 05 01 02 00 00 00 00 scan mode of sensors ON once

SENSORS_SCAN_MODE_OFF

| byte 0 | byte 1 | byte 2 | byte 3 | byte 4 | byte 5 | byte 6 | byte 7 | byte 8 | byte 9 |
|--------|-----------|----------------|----------------|----------------|------------|------------|----------------------|----------------------|----------------------|
| Head | PC add | Unit # A-sb | Unit # B-sb | Unit # C-sb | CMD msb | CMD lsb | - 8 bits - | - 8 bits - | CRC |
| | | | | | | | | | |
| 8 bit | 2 bit | 6 bit | 8 bit | 8 bit | 8 bit | 8 bit | Dat1 msb 4 bit | Dat2 msb 4 bit | Dat3 msb 4 bit |
| 01 | P | 00 | 00 | A | 01 | 03 | x | x | x |
| | | | | | | | Dat1 lsb 4 bit | Dat2 lsb 4 bit | Dat3 lsb 4 bit |
| | | | | | | | | | 8 bits |

Stop scanning the Toy control device sensors.

P: Computer address 00-03 H
A: unit address - 00-FF H

4 example:

1. 01 00 00 05 01 03 00 00 00 00 scan mode of sensors OFF

C. AUDIO OUT COMMANDSSTART_AUDIO_PLAY

| byte 0 | byte 1 | byte 2 | byte 3 | byte 4 | byte 5 | byte 6 | byte 7 | byte 8 | byte 9 |
|--------|-----------|----------------|----------------|----------------|------------|------------|----------------------|----------------------|----------------------|
| Head | PC add | Unit # A-sb | Unit # B-sb | Unit # C-sb | CMD msb | CMD lsb | - 8 bits - | - 8 bits - | CRC |
| 8 bit | 2 bit | 6 bit | 8 bit | 8 bit | 8 bit | 8 bit | Dat1 msb 4 bit | Dat2 msb 4 bit | Dat3 msb 4 bit |
| 01 | P | 00 | 00 | A | 02 | 00 | x | x | xx |
| | | | | | | | Dat1 lsb 4 bit | Dat2 lsb 4 bit | Dat3 lsb 4 bit |
| | | | | | | | | | 8 bits |

Start playing an audio in a speaker of the Toy control device The Audio is sent to the Toy control device by the computer sound card and the Computer radio interface.

42

P: Computer address 00-03 H
A: unit address - 00-FF H

1. 01 00 00 05 02 00 00 00 00 00 Start audio-play

STOP_AUDIO_PLAY

| byte 0 | byte 1 | byte 2 | byte 3 | byte 4 | byte 5 | byte 6 | byte 7 | byte 8 | byte 9 |
|--------|--------|--------|--------|--------|--------|-------------|-------------|-------------|--------|
| Head | PC | Unit # | Unit # | CMD | CMD | - 8 bits - | - 8 bits - | - 8 bits - | CRC |
| | add | A-sb | B-sb | msb | lsb | | | | |
| 8 bit | 2 bit | 6 bit | 8 bit | 8 bit | 8 bit | Dat1 msb | Dat2 msb | Dat3 msb | 8 bits |
| 01 | P | 00 | 00 | 02 | 01 | 4 bit | 4 bit | 4 bit | |
| | | | A | | | x | x | x | |

Stop playing an audio in a speaker of the Toy control device.

P: Computer address 00-03 11
A: unit address - 00-FF 11

43 1. 01 00 00 05 02 01 00 00 00 00 Stop audio-play

START_AUDIO_AND_IO_PLAY_FOR_TIME

| byte 0 | byte 1 | byte 2 | byte 3 | byte 4 | byte 5 | byte 6 | byte 7 | byte 8 | byte 9 |
|--------|--------|--------|--------|--------|--------|------------|------------|------------|--------|
| Head | PC | Unit # | Unit # | CMD | CMD | - 8 bits - | - 8 bits - | - 8 bits - | CRC |
| | add | A-sb | B-sb | msb | lsb | | | | |
| | | | | | | Dat1 | Dat2 | Dat3 | |
| | | | | | | msb | lsb | msb | lsb |
| 8 bit | 2 bit | 6 bit | 8 bit | 8 bit | 8 bit | 4 bit | 4 bit | 4 bit | 8 bits |
| 01 | P | 00 | A | 02 | 04 | T1 | T2 | SC | IO |

Start playing an audio in a speaker of the Toy control device and set an io pin to '1'. After time T, stop audio and set IO to '0'. start this command after a delay td*100ms. if SC='1' then after the execution of this command, start the input command SCAN_SENSORS_ON_ONCE (if any sensor is pressed, even during the audio play, send a message to the computer).

- P: Computer address 00-03 11
- A: unit address - 00-FF 11
- IO: i/o number - 0-3 11 (if IO>3 then don't set IO)
- T0,T1,T2: TIME (*100ms) (T0=MMMSB, T1=MSB T0-L.SB)
- td: delay time before execute 0-F 11 (*100ms)
-
1. 01 00 00 05 02 04 80 2A 03 00 Start audio-play and IO # 3 for 6.4 second
640=28011 delay before execution = 10*100ms=1sec
2. 01 00 00 05 02 04 80 2A 13 00 Start audio-play and IO # 3 for 6.4 second and
set scan sensors on once mode.
delay before execution = 10*100ms=1sec

D. AUDIO IN COMMANDS

TRANSMIT_MIC_FOR_TIME

| byte 0 | byte 1 | byte 2 | byte 3 | byte 4 | byte 5 | byte 6 | byte 7 | byte 8 | byte 9 |
|--------|--------|----------------|----------------|----------------|------------|------------|---------------|---------------|--------|
| Head | PC | Unit # A-sb | Unit # B-sb | Unit # C-sb | CMD msb | CMD lsb | - 8 bits - | - 8 bits - | CRC |
| | | | | | | | | | |
| 8 bit | 2 bit | 6 bit | 8 bit | 8 bit | 8 bit | 4 bit | 4 bit | 4 bit | 8 bits |
| 01 | P | 00 | 00 | A | 03 | 00 | x | x | x |

Requests the Toy control device to Transmit microphone audio from the Toy control device to the Computer radio interface and to the sound card of the computer for time T.

P: Computer address 00-03 H-I

A: unit address -

[illegible]

example:

- ```
1. 01 00 00 05 03 00 0A 00 00 00
```

E. GENERAL TOY COMMANDS

GOTO\_SLEEP\_MODE

| byte 0    | byte 1         | byte 2         | byte 3         | byte 4     | byte 5     | byte 6               | byte 7               | byte 8               | byte 9 |
|-----------|----------------|----------------|----------------|------------|------------|----------------------|----------------------|----------------------|--------|
| PC<br>add | Unit #<br>A-sb | Unit #<br>B-sb | Unit #<br>C-sb | CMD<br>msb | CMD<br>lsb | - 8<br>bits -        | - 8<br>bits -        | - 8<br>bits -        | CRC    |
| 8 bit     | 2 bit          | 6 bit          | 8 bit          | 8 bit      | 8 bit      | Dat1<br>msb<br>4 bit | Dat2<br>msb<br>4 bit | Dat3<br>msb<br>4 bit | 8 bits |
| 01        | P              | 00             | 00             | A          | 04         | 01                   | x                    | x                    | x      |

Requests the Toy control device to go into power save mode (sleep).

- P: Computer address 00-03 11
- A: unit address - 00-FF 11
- L: 01 00 00 05 04 01 00 00 00 00 switch the Toy control device into sleep mode.

**GOTO\_AWAKE\_MODE**

| byte 0 | byte  | 1              | byte 2         | byte 3         | byte 4     | byte 5     | byte 6               | byte 7               | byte 8               | byte 9 |
|--------|-------|----------------|----------------|----------------|------------|------------|----------------------|----------------------|----------------------|--------|
| Head   | PC    | Unit #<br>A-sb | Unit #<br>B-sb | Unit #<br>C-sb | CMD<br>msb | CMD<br>lsb | - 8<br>bits -        | - 8<br>bits -        | - 8<br>bits -        | CRC    |
|        |       |                |                |                |            |            |                      |                      |                      |        |
| 8 bit  | 2 bit | 6 bit          | 8 bit          | 8 bit          | 8 bit      | 8 bit      | Dat1<br>msb<br>4 bit | Dat2<br>msb<br>4 bit | Dat3<br>msb<br>4 bit | 8 bits |
| 01     | P     | 00             | 00             | A              | 04         | 02         | x                    | x                    | x                    | x      |

Requests the Toy control device to go into an awake mode.

|    |                  |       |   |
|----|------------------|-------|---|
| P: | Computer address | 00-03 | H |
| A: | unit address -   | 00-FF | H |

1. 01 00 00 05 04 02 00 00 00 00 switch the Toy control device into awake mode.

## TOY\_RESET

| byte 0 | byte 1    | byte 2         | byte 3         | byte 4         | byte 5     | byte 6     | byte 7        | byte 8        | byte 9      |
|--------|-----------|----------------|----------------|----------------|------------|------------|---------------|---------------|-------------|
| Head   | PC<br>add | Unit #<br>A-sb | Unit #<br>B-sb | Unit #<br>C-sb | CMD<br>msb | CMD<br>lsb | - 8<br>bits - | - 8<br>bits - | CRC         |
| 8 bit  | 2 bit     | 6 bit          | 8 bit          | 8 bit          | 8 bit      | 8 bit      | 4 bit         | 4 bit         | 8 bits      |
| 01     | P         | 00             | 00             | A              | 04         | 0F         | x             | x             | x           |
|        |           |                |                |                |            |            | Dat1<br>msb   | Dat2<br>msb   | Dat3<br>msb |
|        |           |                |                |                |            |            | Dat1<br>lsb   | Dat2<br>lsb   | Dat3<br>lsb |
|        |           |                |                |                |            |            | 4 bit         | 4 bit         | 4 bit       |
|        |           |                |                |                |            |            | x             | x             | x           |

Requests the Toy control device to perform RESET

P: Computer address 00-03 11  
 A: unit address - 00-FF H

48 1. 01 00 00 05 04 0F 00 00 00 00 Toy reset



**F. TELEMETRY**

Information sent by the Toy control device, as an ACK to the command received from the Computer radio interface.

**OK\_ACK**

| byte 0 | byte  | 1      | byte 2 | byte 3 | byte 4 | byte 5 | byte 6      | byte 7      | byte 8      | byte   |
|--------|-------|--------|--------|--------|--------|--------|-------------|-------------|-------------|--------|
| Head   | PC    | Unit # | Unit # | Unit # | CMD    | CMD    | - 8 bits -  | - 8 bits -  | - 8 bits -  | CRC    |
|        | add   | A-sb   | B-sb   | C-sb   | msb    | lsb    |             |             |             |        |
| 8 bit  | 2 bit | 6 bit  | 8 bit  | 8 bit  | 8 bit  | 8 bit  | Dat1<br>msb | Dat2<br>msb | Dat3<br>msb | 8 bits |
| 01     | P     | 00     | 00     | A      | 0A     | 00     | 4 bit       | 4 bit       | 4 bit       | 8 bits |
|        |       |        |        |        |        |        | cmd1        | cmd2        | cmd3        |        |
|        |       |        |        |        |        |        |             |             | sen1        |        |
|        |       |        |        |        |        |        |             |             | sen2        |        |

Send back an ACK about the command that was received ok.

- P: Computer address 00-03 II
- A: unit address - 00-FF II
- cmd 1,2: Received command MSB ok ack. 00-FF II
- cmd 3,4: Received command LSB ok ack. 00-FF II
- sen 1,2 Sensors 0-7 status 00-FF II
1. 01 60 00 05 0A 00 01 01 FF 00 OK ack for 0101 command (sensors scan mode on command) . status: all sensors are not pressed (FF).  
the computer\_radio\_interface number is 6.
2. 01 60 00 05 0A 00 01 01 FE 00 OK ack for 0101 command (sensors scan mode on command) . status: sensor # 8 is pressed (FE)  
the computer\_radio\_interface number is 6.



**G. REQUESTS**

Requests sent by the Toy control device, after an event.

**TOY\_IS\_AWAKE\_REQ**

| byte 0 | byte 1    | byte 2         | byte 3         | byte 4     | byte 5     | byte 6               | byte 7               | byte 8               | byte 9 |
|--------|-----------|----------------|----------------|------------|------------|----------------------|----------------------|----------------------|--------|
| Header | PC<br>add | Unit #<br>B-sb | Unit #<br>C-sb | CMD<br>msb | CMD<br>lsb | - 8<br>bits -        | - 8<br>bits -        | - 8<br>bits -        | CRC    |
|        |           |                |                |            |            |                      |                      |                      |        |
| 8 bit  | 2 bit     | 6 bit          | 8 bit          | 8 bit      | 8 bit      | Dat1<br>msb<br>4 bit | Dat2<br>msb<br>4 bit | Dat3<br>msb<br>4 bit | 8 bits |
| 01     | P         | 00             | A              | 0A         | 00         | c1                   | x                    | x                    |        |

Send a message to the Computer radio interface if the Toy control device goes from sleep mode to awake mode.

51

- P: Computer address 00-03 II  
A: unit address - 00-FF II  
c1,c2: status command AB II
- I. 01 60 00 05 0A 00 AB 00 FF 00 Toy is awake message.

## II. CRI (Computer Radio Interface) - commands

Commands that are sent only to the Computer radio interface.

## SWITCH AUDIO OUT TO RADIO & TRANSMIT

| byte 0 | byte   | 1           | byte 2      | byte 3      | byte 4  | byte 5  | byte 6            | byte 7            | byte 8            | byte 9            |
|--------|--------|-------------|-------------|-------------|---------|---------|-------------------|-------------------|-------------------|-------------------|
| Header | PC add | Unit # A-sb | Unit # B-sb | Unit # C-sb | CMD msb | CMD lsb | - 8 bits -        | - 8 bits -        | - 8 bits -        | CRC               |
| 8 bit  | 2 bit  | 6 bit       | 8 bit       | 8 bit       | 8 bit   | 8 bit   | Dat1 msb<br>4 bit | Dat1 lsb<br>4 bit | Dat2 msb<br>4 bit | Dat2 lsb<br>4 bit |
| 01     | P      | 00          | 00          | x           | 0C      | 00      | x                 | x                 | x                 | x                 |

52

Requests the Computer radio interface to switch audio out from the computer sound card to the radio wireless transceiver and transmit.

P: Computer address

00-03 H-1

## SWITCH\_AUDIO\_OUT\_TO\_JACK\_&amp;\_STOP\_TRANSMIT

| byte 0 | byte 1    | byte 2         | byte 3         | byte 4         | byte 5     | byte 6     | byte 7               | byte 8               | byte 9               |
|--------|-----------|----------------|----------------|----------------|------------|------------|----------------------|----------------------|----------------------|
| Head   | PC<br>add | Unit #<br>A-sb | Unit #<br>B-sb | Unit #<br>C-sb | CMD<br>msb | CMD<br>lsb | - 8<br>bits -        | - 8<br>bits -        | CRC                  |
| 8 bit  | 2 bit     | 6 bit          | 8 bit          | 8 bit          | 8 bit      | 8 bit      | Dat1<br>msb<br>4 bit | Dat2<br>msb<br>4 bit | Dat3<br>msb<br>4 bit |
| 01     | P         | 00             | 00             | x              | 0C         | 01         | x                    | x                    | x                    |

Requests the Computer radio interface to switch audio\_out from the radio RF wireless transceiver to the speakers jack and to stop transmit.

P: Computer address 00-03 11

## MUTE\_RADIO

| byte 0 | byte 1    | byte 2         | byte 3         | byte 4         | byte 5     | byte 6     | byte 7               | byte 8               | byte 9               |
|--------|-----------|----------------|----------------|----------------|------------|------------|----------------------|----------------------|----------------------|
| Head   | PC<br>add | Unit #<br>A-sb | Unit #<br>B-sb | Unit #<br>C-sb | CMD<br>msb | CMD<br>lsb | - 8<br>bits -        | - 8<br>bits -        | CRC                  |
| 8 bit  | 2 bit     | 6 bit          | 8 bit          | 8 bit          | 8 bit      | 8 bit      | Dat1<br>msb<br>4 bit | Dat2<br>msb<br>4 bit | Dat3<br>msb<br>4 bit |
| 01     | P         | 00             | 00             | x              | 0C         | 02         | x                    | x                    | x                    |

Mute the radio transmit.

P: Computer address 00-03 11

## UN-MUTE\_RADIO

| byte 0 | byte  | Unit # | byte 2 | byte 3 | byte 4 | byte 5 | byte 6      | byte 7      | byte 8      | byte 9 |
|--------|-------|--------|--------|--------|--------|--------|-------------|-------------|-------------|--------|
| Head   | PC    | Unit # | Unit # | Unit # | CMD    | CMD    | - 8 bits -  | - 8 bits -  | - 8 bits -  | CRC    |
|        | add   | A-sb   | B-sb   | C-sb   | msb    | lsb    |             |             |             |        |
|        |       |        |        |        |        |        | Dat1<br>msb | Dat2<br>msb | Dat3<br>msb |        |
|        |       |        |        |        |        |        | Dat1<br>lsb | Dat2<br>lsb | Dat3<br>lsb |        |
| 8 bit  | 2 bit | 6 bit  | 8 bit  | 8 bit  | 8 bit  | 8 bit  | 4 bit       | 4 bit       | 4 bit       | 8 bits |
| 01     | 00    | 00     | 00     | x      | 0C     | 03     | x           | x           | x           |        |

**UN-Mute the radio transmit.**

**CRI\_RESET**

| byte 0 | byte 1    | byte 2         | byte 3         | byte 4         | byte 5     | byte 6      | byte 7      | byte 8      | byte 9 |
|--------|-----------|----------------|----------------|----------------|------------|-------------|-------------|-------------|--------|
| Head   | PC<br>add | Unit #<br>A-sb | Unit #<br>B-sb | Unit #<br>C-sb | CMD<br>msb | CMD<br>lsb  | - 8 bits -  | - 8 bits -  | CRC    |
|        |           |                |                |                |            | Dat1<br>msb | Dat2<br>msb | Dat3<br>msb |        |
| 8 bit  | 2 bit     | 6 bit          | 8 bit          | 8 bit          | 8 bit      | 4 bit       | 4 bit       | 4 bit       | 8 bits |
| 01     | P         | 00             | 00             | x              | 0C         | x           | x           | x           | x      |

Perform software reset on the Computer radio interface unit.

P: Computer address 00-03 1-1

## I. CRI - ACK

ACK sent only to the Computer by the Computer radio interface, only after CRI commands.

### CRI\_COMMAND\_ACK

| byte 0 | byte 1 | byte 2      | byte 3      | byte 4      | byte 5  | byte 6  | byte 7     | byte 8     | byte 9     |
|--------|--------|-------------|-------------|-------------|---------|---------|------------|------------|------------|
| Head   | PC add | Unit # A-sb | Unit # B-sb | Unit # C-sb | CMD msb | CMD lsb | - 8 bits - | - 8 bits - | - 8 bits - |
|        |        |             |             |             |         |         | Dat1 msb   | Dat1 lsb   | Dat2 msb   |
| 8 bit  | 2 bit  | 6 bit       | 8 bit       | 8 bit       | 8 bit   | 8 bit   | 4 bit      | 4 bit      | 4 bit      |
| 01     | P      | 00          | 00          | x           | 0D      | 00      | cmd1       | cmd2       | cmd3       |
|        |        |             |             |             |         |         | cmd4       | x          | x          |
|        |        |             |             |             |         |         | Dat3 msb   | Dat3 lsb   | 8 bits     |
|        |        |             |             |             |         |         |            |            | CRC        |

This is an ACK for a CRI command. this ACK is sent to the computer by the computer-radio-interface, after executing a command successfully.

P: Computer address 00-03 H  
cmd 1,2: Received CRI command MSB ok ack. 00-FF H  
cmd 3,4: Received CRI command LSB ok ack. 00-FF H

1. 01 60 00 00 0D 00 0C 01 00 00 OK ack for 0C01 CRI command (SWITCH AUDIO OUT TO JACK)  
the computer\_radio\_interface number is 6.
2. 01 60 00 00 0D 00 0C 0F 00 00 OK ack for 0C0F CRI command (CRI reset)  
the computer\_radio\_interface number is 6.

This ack is also sent on POWER UP RESET

Reference is now made to Fig. 8A, which is a simplified flowchart illustration of a preferred method for receiving radio signals, executing commands comprised therein, and sending radio signals, within the toy control device 130 of Fig. 1A. Typically, each message as described above comprises a command, which may include a command to process information also comprised in the message. The method of Fig. 8A preferably comprises the following steps:

A synchronization signal or preamble is detected (step 400). A header is detected (step 403).

A command contained in the signal is received (step 405).

The command contained in the signal is executed (step 410). Executing the command may be as described above with reference to Fig. 1A.

A signal comprising a command intended for the computer radio interface 110 is sent (step 420).

Reference is now made to Figs. 8B - 8T which, taken together, comprise a simplified flowchart illustration of a preferred implementation of the method of Fig. 8A. The method of Figs. 8B - 8T is self-explanatory.

Reference is now made to Fig. 9A, which is a simplified flowchart illustration of a preferred method for receiving MIDI signals, receiving radio signals, executing commands comprised therein, sending radio signals, and sending MIDI signals, within the computer radio interface 110 of Fig. 1A. Some of the steps of Fig. 9A are identical to steps of Fig. 8A, described above. Fig. 9A also preferably comprises the following steps:

A MIDI command is received from the computer 100 (step 430). The MIDI command may comprise a command intended to be transmitted to the toy control device 130, may comprise an audio in or audio out command, or may comprise a general command.

A MIDI command is sent to the computer 100 (step 440). The MIDI command may comprise a signal received from the toy control device 130, may comprise a response to a MIDI command previously received by the computer radio interface 110 from the computer 100, or may comprise a general command.

The command contained in the MIDI command or in the received signal is executed (step 450). Executing the command may comprise, in the case of a received signal, reporting the command to the computer 100, whereupon the computer 100 may typically carry out any appropriate action under program control as, for example, changing a screen display or taking any other appropriate action in response to the received command. In the case of a MIDI command received from the computer 100, executing the command may comprise transmitting the command to the toy control device 130. Executing a MIDI command may also comprise switching audio output of the computer control device 110 between the secondary audio interface 230 and the radio transceiver 260. Normally the secondary audio interface 230 is directly connected to the audio interface 220 preserving the connection between the computer sound board and the peripheral audio devices such as speakers, microphone and stereo system.

Reference is now made to Figs. 9B - 9N, and additionally reference is made back to Figs. 8D - 8M, all of which, taken together, comprise a simplified flowchart illustration of a preferred implementation of the method of Fig. 9A. The method of Figs. 9B - 9M, taken together with Figs. 8D - 8M, is self-explanatory.

Reference is now additionally made to Figs. 10A - 10C, which are simplified pictorial illustrations of a signal transmitted between the computer radio interface 110 and the toy control device 130 of Fig. 1A. Fig. 10A comprises a synchronization preamble. The duration  $T_{\text{SYNC}}$  of the synchronization preamble is preferably .500 millisecond, being preferably substantially equally divided into on and off components.

Fig. 10B comprises a signal representing a bit with value 0, while Fig. 10C comprises a signal representing a bit with value 1.

It is appreciated that Figs. 10B and 10C refer to the case where the apparatus of Fig. 5D is used. In the case of the apparatus of Fig. 5E, functionality corresponding to that depicted in Figs. 10B and 10C is provided within the apparatus of Fig. 5E.

Preferably, each bit is assigned a predetermined duration  $T$ , which is the same for every bit. A frequency modulated carrier is transmitted, using the method of frequency modulation keying as is well known in the art. An "off" signal (typically less

than 0.7 Volts) presented at termination 5 of U2 in Fig. 5D causes a transmission at a frequency below the median channel frequency. An "on" signal (typically over 2.3 Volts) presented at pin 5 of U2 in Fig. 5D causes a transmission at a frequency above the median frequency. These signals are received by the corresponding receiver U1. Output signal from pin 6 of U1 is fed to the comparator 280 of Figs. 4 and 6 that is operative to determine whether the received signal is "off" or "on", respectively.

It is also possible to use the comparator that is contained within U1 by connecting pin 7 of U1 of Fig. 5D, through pin 6 of the connector J1 of Fig. 5D, pin 6 of connector J1 of Fig. 5A, through the jumper to pin 12 of U1 of Fig. 5A.

Preferably, receipt of an on signal or spike of duration less than  $0.01 * T$  is ignored. Receipt of an on signal as shown in Fig. 10B, of duration between  $0.01 * T$  and  $0.40 * T$  is preferably taken to be a bit with value 0. Receipt of an on signal as shown in Fig. 10C, of duration greater than  $0.40 * T$  is preferably taken to be a bit with value 1. Typically, T has a value of 1.0 millisecond.

Furthermore, after receipt of an on signal, the duration of the subsequent off signal is measured. The sum of the durations of the on signal and the off signal must be between  $0.90 T$  and  $1.10 T$  for the bit to be considered valid. Otherwise, the bit is considered invalid and is ignored.

Reference is now made to Fig. 11, which is a simplified flowchart illustration of a method for generating control instructions for the apparatus of Fig. 1A. The method of Fig. 11 preferably includes the following steps:

A toy is selected (step 550). At least one command is selected, preferably from a plurality of commands associated with the selected toy (steps 560 - 580). Alternatively, a command may be entered by selecting, modifying, and creating a new binary command (step 585).

Typically, selecting a command in steps 560 - 580 may include choosing a command and specifying one or more control parameters associated with the command. A control parameter may include, for example, a condition depending on a result of a previous command, the previous command being associated either with the selected toy or with another toy. A control parameter may also include an execution condition governing execution of a command such as, for example: a condition stating that a



specified output is to occur based on a status of the toy, that is, if and only if a specified input is received; a condition stating that the command is to be performed at a specified time; a condition stating that performance of the command is to cease at a specified time; a condition comprising a command modifier modifying execution of the command, such as, for example, to terminate execution of the command in a case where execution of the command continues over a period of time; a condition dependent on the occurrence of a future event; or another condition.

The command may comprise a command to cancel a previous command.

The output of the method of Fig. 11 typically comprises one or more control instructions implementing the specified command, generated in step 590. Typically, the one or more control instructions are comprised in a command file. Typically, the command file is called from a driver program which typically determines which command is to be executed at a given point in time and then calls the command file associated with the given command.

Preferably, a user of the method of Fig. 11 performs steps 550 and 560 using a computer having a graphical user interface. Reference is now made to Figs. 12A - 12C, which are pictorial illustrations of a preferred embodiment of a graphical user interface implementation of the method of Fig. 11.

Fig. 12A comprises a toy selection area 600, comprising a plurality of toy selection icons 610, each depicting a toy. The user of the graphical user interface of Figs. 12A - 12C typically selects one of the toy selection icons 610, indicating that a command is to be specified for the selected toy.

Fig. 12A also typically comprises action buttons 620, typically comprising one or more of the following:

- a button allowing the user, typically an expert user, to enter a direct binary command implementing an advanced or particularly complex command not otherwise available through the graphical user interface of Figs. 12A - 12C;

- a button allowing the user to install a new toy, thus adding a new toy selection icon 610; and

- a button allowing the user to exit the graphical user interface of Figs. 12A - 12C.

Fig. 12B depicts a command generator screen typically displayed after the user has selected one of the toy selection icons 610 of Fig. 12A. Fig. 12B comprises an animation area 630, preferably comprising a depiction of the selected toy selection icon 610, and a text area 635 comprising text describing the selected toy.

Fig. 12B also comprises a plurality of command category buttons 640, each of which allow the user to select a category of commands such as, for example: output commands; input commands; audio in commands; audio out commands; and general commands.

Fig. 12B also comprises a cancel button 645 to cancel command selection and return to the screen of Fig. 12A.

Fig. 12C comprises a command selection area 650, allowing the user to specify a specific command. A wide variety of commands may be specified, and the commands shown in Fig. 12C are shown by way of example only.

Fig. 12C also comprises a file name area 655, in which the user may specify the name of the file which is to receive the generated control instructions. Fig. 12C also comprises a cancel button 645, similar to the cancel button 645 of Fig. 12B. Fig. 12C also comprises a make button 660. When the user actuates the make button 660, the control instruction generator of Fig. 11 generates control instructions implementing the chosen command for the chosen toy, and writes the control instructions to the specified file.

Fig. 12C also comprises a parameter selection area 665, in which the user may specify a parameter associated with the chosen command.

The steps for programming the microcontrollers of the present invention include the use of a universal programmer, such as the Universal Programmer, type EXPRO 60/80, manufactured by Sunshine Electronics Co. Ltd., Taipei, Taiwan.

The above-described embodiment of Fig. 1C includes a description of a preferred set of predefined messages including a category termed "General commands". Other General Commands are defined by the following description:



## TOY\_AVAILABILITY\_COMMAND

| byte 0 | byte 1    | byte 2         | byte 3         | byte 4     | byte 5     | byte 6        | byte 7        | byte 8        | byte 9 |
|--------|-----------|----------------|----------------|------------|------------|---------------|---------------|---------------|--------|
| Head   | PC<br>add | Unit #<br>A-sb | Unit #<br>B-sb | CMD<br>msb | CMD<br>lsb | - 8<br>bits - | - 8<br>bits - | - 8<br>bits - | CRC    |
| 8 bit  | 2 bit     | 6 bit          | 8 bit          | 8 bit      | 8 bit      | Dat1<br>msb   | Dat2<br>lsb   | Dat3<br>msb   | 8 bits |
| 01     | P         | 00             | A              | 04         | 07         | 4 bit         | 4 bit         | 4 bit         | 8 bits |
|        |           |                |                |            |            | 00            | 00            | x             | x      |

A Toy transmits this command to declare its existence and receive in response a Channel Pair Selection Command designating the computer that will control it and the radio channels to use.

P: Computer address 00-03 H  
A: unit address - 00-FF H

62

## CHANNEL\_PAIR\_SELECTION\_COMMAND

| byte 0 | byte 1    | byte 2         | byte 3         | byte 4     | byte 5     | byte 6        | byte 7        | byte 8        | byte 9 |
|--------|-----------|----------------|----------------|------------|------------|---------------|---------------|---------------|--------|
| Head   | PC<br>add | Unit #<br>A-sb | Unit #<br>B-sb | CMD<br>msb | CMD<br>lsb | - 8<br>bits - | - 8<br>bits - | - 8<br>bits - | CRC    |
| 8 bit  | 2 bit     | 6 bit          | 8 bit          | 8 bit      | 8 bit      | Dat1<br>msb   | Dat2<br>lsb   | Dat3<br>msb   | 8 bits |
| 01     | P         | 00             | A              | 04         | 08         | 4 bit         | 4 bit         | 4 bit         | 8 bits |
|        |           |                |                |            |            | CH1           | CH2           | 00            | x      |
|        |           |                |                |            |            | 00            | 00            | x             | x      |

A computer transmits this command in response to a Toy Availability Command to inform the toy the radio channels to be used.

P: Computer address 00-03 H  
A: unit address - 00-FF H  
CH1: Toy transmit channel 0- F H  
CH2: Toy receive channel 0- F H

In Figs. 13 and 14 there are illustrated block diagrams of multiport multi-channel implementation of the computer radio interface 110 of Fig. 1A. Fig. 13 illustrates the processing sub-unit of the computer interface that is implemented as an add-in board installed inside a PC. Fig. 14 is the RF transceiver which is a device external to the computer and connects to the processing subunit by means of a cable. In the present application of the RF unit there are 4 transceivers each capable of utilizing two radio channels simultaneously.

Referring briefly to Fig. 3, it is appreciated that, optionally, both sound and control commands may be transmitted via the MIDI connector 210 rather than transmitting sound commands via the analog connector 220. It is additionally appreciated that the functions of the interfaces 210 and 220 between the computer radio interface 110 and the sound card 190 may, alternatively, be implemented as connections between the computer radio interface 110 to the serial and/or parallel ports of the computer 100, as shown in Figs. 25A - 25E and Figs 26A -26D, respectively.

If it is desired to provide full duplex communication, each transceiver 260 which forms part of the computer radio interface 110 of Fig. 1A preferably is operative to transmit on a first channel pair and to receive on a different, second channel pair. The transceiver 260 (Fig. 4) which forms part of the toy control device 130 of Fig. 1A preferably is operative to transmit on the second channel and to receive on the first channel.

Any suitable technology may be employed to define at least two channel pairs such as narrow band technology or spread spectrum technologies such as frequency hopping technology or direct sequence technology, as illustrated in Figs. 15A - 15E, showing a Multi-Channel Computer Radio Interface, and in Figs. 24A - 24E showing a Multi-Channel Toy Control Device.

Reference is now made to Fig. 16 which is a simplified flowchart illustration of a preferred method of operation of a computer radio interface (CRI) 110 operative to service an individual computer 100 of Fig. 1A without interfering with other computers or being interfered with by the other computers, each of which is similarly serviced by a similar CRI. Typically, the method of Fig. 16 is implemented in software on the computer 100 of Fig. 1A.

The CRI includes a conventional radio transceiver (260 of Fig. 4) which may, for example, comprise an RY3 GB021 having 40 channels which are divided into 20 pairs of channels. Typically, 16 of the channel pairs are assigned to information communication and the remaining 4 channel pairs are designated as control channels.

In the method of Fig. 16, one of the 4 control channel pairs is selected by the radio interface (step 810) as described in detail below in Fig. 17. The selected control channel pair *i* is monitored by a first transceiver (step 820) to detect the appearance of a new toy which is signaled by arrival of a toy availability command from the new toy (step 816). When the new toy is detected, an information communication channel pair is selected (step 830) from among the 16 such channel pairs provided over which game program information will be transmitted to the new toy. A preferred method for implementing step 830 is illustrated in self-explanatory flowchart Fig. 18A. The "Locate Computer" command in Fig. 18A (step 1004) is illustrated in the flowchart of Fig. 18B.

The identity of the selected information communication channel pair, also termed herein a "channel pair selection command", is sent over the control channel pair to the new toy (step 840). A game program is then begun (step 850), using the selected information communication channel pair. The control channel pair is then free to receive and act upon a toy availability command received from another toy. Therefore, it is desirable to assign another transceiver to that control channel pair since the current transceiver is now being used to provide communication between the game and the toy.

To assign a further transceiver to the now un-monitored control channel, the transceiver which was formerly monitoring that control channel is marked as busy in a transceiver availability table (step 852). The transceiver availability table is then scanned until an available transceiver, i.e. a transceiver which is not marked as busy, is identified (step 854). This transceiver is then assigned to the control channel *i* (step 858).

Fig. 17 is a simplified flowchart illustration of a preferred method for implementing "select control channel pair" step 810 of Fig. 16. In Fig. 17, the four control channels are scanned. For each channel pair in which the noise level falls below a certain threshold (step 895), the computer sends an availability interrogation command (step 910) and waits for a predetermined time period, such as 250 ms, for a response (steps 930 and 940). If no other computer responds, i.e. sends back an "availability

response command", then the channel pair is deemed vacant. If the channel pair is found to be occupied the next channel is scanned. If none of the four channel pairs are found to be vacant, a "no control channel available" message is returned.

Fig. 19 is a self-explanatory flowchart illustration of a preferred method of operation of the toy control device 130 which is useful in conjunction with the "multi-channel" embodiment of Figs. 16 - 18B.  $i = 1, \dots, 4$  is an index of the control channels of the system. The toy control device sends a "toy availability command" (step 1160) which is a message advertising the toy's availability, on each control channel  $i$  in turn (steps 1140, 1150, 1210), until a control channel is reached which is being monitored by a computer. This becomes apparent when the computer responds (step 1180) by transmitting a "channel pair selection command" which is a message designating the information channel pair over which the toy control device may communicate with the game running on the computer. At this point (step 1190), the toy control device may begin receiving and executing game commands which the computer transmits over the information channel pair designated in the control channel  $i$ .

According to a preferred embodiment of the present invention, a computer system is provided, in communication with a remote game server, as shown in Fig. 20. The remote game server 1250 is operative to serve to the computer 100 at least a portion of at least one toy-operating game, which operates one or more toys 1260. Optionally, an entire game may be downloaded from the remote game server 1250. However, alternatively, a new toy action script or new text files may be downloaded from the remote game server 1250 whereas the remaining components of a particular game may already be present in the memory of computer 100.

Downloading from the remote game server 1250 to the computer 100 may take place either off-line, before the game begins, or on-line, in the course of the game. Alternatively, a first portion of the game may be received off-line whereas an additional portion of the game is received on-line.

The communication between the remote game server 1250 and the computer 100 may be based on any suitable technology such as but not limited to ISDN; X.25; Frame-Relay; and Internet.

An advantage of the embodiment of Fig. 20 is that a very simple computerized device may be provided locally, i.e. adjacent to the toy, because all "intelligence" may be provided from a remote source. In particular, the computerized device may be less sophisticated than a personal computer, may lack a display monitor of its own, and may, for example, comprise a network computer 1270.

Fig. 21 is a simplified flowchart illustration of the operation of the computer 100 or of the network computer 1260 of Fig. 20, when operating in conjunction with the remote server 1250.

Fig. 22 is a simplified flowchart illustration of the operation of the remote game server 1250 of Fig. 20.

Fig. 23 is a semi-pictorial semi-block diagram illustration of a wireless computer controlled toy system including a toy 1500 having a toy control device 1504, a computer 1510 communicating with the toy control device 1504 by means of a computer-radio interface 1514 and a proximity detection subsystem operative to detect proximity between the toy and the computer. The proximity detection subsystem may for example include a pair of ultrasound transducers 1520 and 1530 associated with the toy and computer respectively. The toy's ultrasound transducer 1520 typically broadcasts ultrasonic signals which the computer's ultrasound transducer 1530 detects if the computer and toy are within ultrasonic communication range, e.g. are in the same room.

Figs. 24A - 24E, taken together, form a detailed electronic schematic diagram of a multi-channel implementation of the computer radio interface 110 of Fig. 3 which is similar to the detailed electronic schematic diagrams of Figs. 5A - 5D except for being multi-channel, therefore capable of supporting full duplex applications, rather than single-channel.

Figs. 25A - 25E, taken together, form a detailed schematic illustration of a computer radio interface which connects to a serial port of a computer rather than to the sound board of the computer.

Figs. 26A - 26D, taken together, form a detailed schematic illustration of a computer radio interface which connects to a parallel port of a computer rather than to the sound board of the computer.



Figs. 27A - 27J are preferred self-explanatory flowchart illustrations or a preferred radio coding technique, based on the Manchester coding, which is an alternative to the radio coding technique described above with reference to Figs. 8E, 8G - 8M and 10A - C.

Figs. 28A - 28K, taken together, form a detailed electronic schematic diagram of the multi-port multi-channel computer radio interface sub-unit of Fig. 13.

Figs. 29A - 29I, taken together, form a detailed electronic schematic diagram of the multi-port multi-channel computer radio interface sub-unit of Fig. 14.

Fig. 30 illustrates a further embodiment of the present invention which includes a combination of a Computer Radio Interface (CRI) and a Toy Control Device (TCD), 1610.

The combined unit 1610 controls a toy 1620 which is connected to the computer 100 by a device, such as a cable, and communicates with other toys, 120, by means such as radio communication, using the computer radio interface 110. The toy 1620 is operated in a similar manner as the toy device 120.

Fig. 31 illustrates a simplified block diagram of the combined unit 1610.

Figs. 32A, 32B and 32C taken together form a simplified schematic diagram of the EP900 EPLD chip (U9) of Fig. 28H. The code to program the EPLD chip for this schematic diagram preferably uses the programming package "Max Plus II Ver. 6.2" available from Altera Corporation, 3525 Monroe Street, Santa Clara, CA. 95051, USA.

Figs. 33 - 81, described hereinbelow, illustrate embodiments of the toy system of Figs. 1 - 32C in the context of an amusement park system.

Figs. 33A - 33C, taken together, form a simplified pictorial illustration of an amusement park system constructed and operative in accordance with a preferred embodiment of the present invention. The amusement park system includes a multiplicity of fanciful toy figures or nodes which are in cable or wireless, such as radio, communication with a central amusement park controller 2010, also termed herein the "central node controller". The central node controller typically includes a computer node interface 2012. A preferred embodiment of computer node interface 2012, for wireless applications, is described in detail below with reference to Figs. 72 - 73. A preferred

embodiment of computer node interface 2012, for cable applications, is described in detail below with reference to Fig. 75.

The multiplicity of fanciful toy figures may, for example, number dozens or even hundreds of fanciful toy figures, including life-size figures. According to one embodiment of the present invention, the fanciful toy figures and/or their surroundings are configured so as to clarify to visitors to the amusement park, the location at which a visitor must stand in order for the figure to "hear" what the visitor is saying and to "participate" in an encounter with the visitor. For example, fanciful toy figures may include a microphone seated within an ear and the visitor may be instructed to speak into the ear of each toy figure with which he wishes to converse.

In the illustrated embodiment, the nodes or radio-communicating toy figures include clown dolls 2020 playing an acrobatic game, elephant dolls 2030 playing a parading game, automatic booths 2040 for dispensing food services and/or for dispensing value such as tickets, tokens, or prizes. Other radio communicating toy figures include boats 2050, boat riding figures 2060 such as Viking figures, talking trees 2070, cow figures 2080, a dairy farmer figure 2090, bear figures 2100 playing a ball game, horse figures 2110 playing a horse race game and referee figures 2120.

Preferably, the amusement park apparatus includes a matrix of stationary locating poles 2045 which are operative to continuously scan their vicinities and identify visitors and/or mobile nodes and/or portable nodes which have entered these vicinities and to report on the identities of these visitors and/or nodes to the central node controller 2010.

Figs. 34 and 35 are simplified pictorial illustrations of some of the elements of an amusement park system constructed and operative in accordance with another preferred embodiment of the present invention. The amusement park system of Fig. 34 includes central amusement park controller 2010 and also a restrictedly mobile reindeer doll 2130 operative to advance along a track 2134, a freely mobile cartoon figure doll 2140, a portable owl doll 2150, a talking, freely mobile clown doll 2160, and a talking stationary tree doll 2170.

Each of the radio communicating elements in Figs. 33 and 34 is preferably equipped with a radio transceiver of which only the antenna 2180 is shown.

Fig. 35 is a simplified pictorial illustration of a second state of the amusement park system of Fig. 34. As may be appreciated by comparing Figs. 34 and 35, the reindeer doll 2130 has advanced along the track 2134, the freely mobile cartoon figure doll 2140 has moved, and a human visitor 2190 has carried the portable owl doll 2150 from one location to another. The clown doll 2160 has moved toward the human visitor 2190, extended his hand, issued a greeting including the name of the visitor, and presented the visitor with a prize. The tree doll 2170, in Fig. 34, is playing a quiz game with a child visitor 2200 whose level of quiz game skill and/or age is preferably known to the tree doll as described in detail below. An adult visitor 2210 is waiting his turn. In Fig. 35, the child visitor 2200 has moved on, and the tree doll 2170 is now quizzing the adult visitor 2210.

Fig. 36 is a simplified pictorial illustration of one of the radio-communicating elements of the amusement park system of Figs. 34 - 35, specifically the portable owl 2150. Each of the radio-communicating elements typically includes an antenna 2180, a node-control device 2214 and an associated power supply 2216. Preferably, some or all of the following functional devices are also provided:

- a. A microphone 2220 and loudspeaker 2230 for communicating with visitors;
- b. A video camera 2240 operative to provide artificial vision;
- c. A motor 2250 for providing motion of the radio-communicating element itself or of portions thereof, such as limbs. In Fig. 36, the motor 2250 flaps the wings.

A preferred hardware implementation of node control device 2214 of Fig. 36 which is suitable for a node whose connection to the central node controller comprises a wireless connection is illustrated in Fig. 71. A preferred hardware implementation of node control device 2214 of Fig. 36 which is suitable for a node whose connection to the central node controller comprises a cable connection is illustrated in Fig. 74.

The dolls of Figs. 33 - 36 may be formed of any suitable material such as suitable plastics.

Figs. 37 - 42 are simplified flowchart illustrations of preferred methods of operation for the central amusement park controller of Fig. 33 which are more easily understood with reference to the data structure illustrated in Figs. 43A - 43C.

Fig. 37 is a simplified flowchart illustration of a preferred method of operation by which the central amusement park controller of Fig. 33 performs each of a multiplicity of node control tasks for each of a corresponding multiplicity of nodes. Preferably, the method of Fig. 37 is repeated constantly or periodically.

The central amusement park controller 2010 preferably includes a multi-tasking operating system such as Unix or Windows NT residing within one or more suitable computers such as one or more Sun workstations or IBM-compatible personal computers interconnected by a suitable network such as an Ethernet LAN. The controller 2010 typically operates an array of DSP boards such as the Antaref boards marketed by Dialogic Corporation, 1515 Route Ten, Parsippany NJ 07054-4596, USA and speech recognition software such as the software marketed by Lernaut and Hauspies, Koning Albert 1 Laan 64, 1780 Wemmel, Belgium. The controller 2010 also typically includes suitable wireless communication circuitry such as a suitable number of the boards illustrated in Figs. 72 - 73. The controller 2010 also or alternatively typically includes cable communication circuitry, such as the circuitry illustrated in Fig. 75.

Each node from among a multiplicity of nodes is preferably operated by a dedicated task. Each node typically communicates with its dedicated task over an independent dedicated communication channel such as that described hereinabove with reference to Figs. 1 - 32C..

More than one task at a time may be involved in control of a single node in order to support concurrent node functions such as playing voice in parallel to moving lips or other portions of the body.

As shown, the method of Fig. 37 includes a visitor localization step 2310, in which each task scans the vicinity of the node which it is controlling, identifies all visitors currently within that vicinity, and reports this "visitor localization information" to the central node controller 2010. A preferred method by which central node controller 2010 handles the visitor localization information arriving from the various tasks and nodes is described in detail below with reference to Fig. 38.

Typically, each game comprises a script including a multiplicity of script items. The relationship between the script items can be represented by a state machine, as described in detail below. Typically, each script item corresponds to a state, represented in Figs. 44, 49, 55 and 61 as a bubble and represented in memory, according to a preferred embodiment of the present invention, as game state record 2810 of Figs. 43A - 43C.

A task which a node performs may include any of the following: a script item 2380; the locating routine of step 2310; and the welcoming routine of step 2350.

Preferably, between script items, the node is instructed to welcome whichever new (i.e. not-yet-welcomed) visitors have arrived thereat. This is psychologically relieving to the new visitors because it clarifies that their presence is recognized and assures them that they are to receive attention in due course.

In step 2360, the central computer determines whether node I is involved in the next script item in the game currently being played by the current visitor at node I. If so, the current visitor remains current. If not, i.e. if node I is not involved in the next script item in the current visitor's game, then the highest priority visitor (typically the longest-waiting visitor) becomes the current visitor (step 2370).

The term "launch" refers to performance by the central computer 2010 of all foreground operations required in order to cause a particular node to perform a particular task. The "launch" is over when only background operations are required to allow the task to go forward.

Fig. 38 is a simplified flowchart illustration of a preferred method by which the central computer 2010 is operative to perform the visitor localization step of Fig. 37. Typically, each visitor wears an identification badge 2405 (Fig. 34) which typically receives radio query signals from the nodes. Typically, the nodes are operative to automatically and periodically generate radio query signals.

Each badge broadcasts a radio acknowledgment signal comprising unique visitor-identification data. Each node, upon receiving a radio acknowledgment signal, measures that signal's energy level. Upon request of the central computer (step 2420), the node transmits the visitor-identification data and the associated energy level to the central computer (step 2430). For each visitor (step 2460), the node who detected the

visitor's identification data with the highest energy level is regarded as being the location of the visitor.

For example, RFID (radio frequency identification) technology such as a U2270B interrogator device may be installed in the node and an e5530 identifying transponder device may be worn by each visitor. Both of the above devices are commercially available from TEMIC, RYODEN Trading Co. Ltd. 3-15-15 Higashi Icobokuru, Toshima Ku, Tokyo 170. Another alternative implementation of the above-described feature is by means of infra-red technology such as the EIRIS system from Elpas Electro-optic Systems Ltd., 11 Hasadna St. Raanana 43650, Israel.

Fig. 39 is a simplified flowchart illustration of a preferred method for performing the "welcome new visitors" step 2350 of Fig. 37. In this step, a welcome message is played to each visitor. Preferably, different welcome messages are played to different visitors, depending, e.g., on the visitors' ages.

Fig. 40 is a simplified flowchart illustration of a preferred method for performing the "launch execution of next script item" step of Fig. 37.

In steps 2520 - 2530, all groups and sub-groups of the current visitor are loaded into the system's memory.

Preferably, players of games can accumulate credits or powers which facilitate later stages of the game. The credits and/or powers are stored in the Credit Record 2830 of Figs. 43A - 43C.

Fig. 41 is a simplified flowchart illustration of a preferred method for performing the "analyze conditions" step of Fig. 40. In Fig. 41, an analysis is performed of all the condition sets of the Game State Record 2810 (Fig. 43A) of the current state of the game currently being played. Typically the analysis is effected by comparison to the relevant credits accumulated either by the visitor or by the group to which he/she belongs, in order to determine which condition set has been fulfilled.

Fig. 42 is a simplified flowchart illustration of a preferred method for performing step 2550 of Fig. 40.

A "state" is a state of the system in which a system performs one or more predefined actions, forming an action set, upon fulfillment of one or more conditions, forming a condition set, and transfers itself into another state once the action set has

been completed. A state may include several condition sets, each associated with one action set and one transition.

An "action sequence" comprises at least a subset of an action set which includes action items which are performed in sequence rather than in parallel. Different action sequences within the same action set may be performed in parallel.

Figs. 43A - 43C, taken together, form a diagram of a data structure typically residing in the central amusement park controller 2010 and suitable for storing information pertaining to the amusement park and its visitors. The data structure includes the following substructures: A Visitor Record 2790, which is comprised of Visitor Profile Record 2800, Past Game Record 2820, Credit Record 2830 and Current Game Track Record 2840; Node Record 2890 which is comprised of Node Profile record 2850, Node Figure Record 2860, Node feature Record 2870 and Class List Record 2880; Game State Record 2810; Play Record 2900; Frequent Inquiry record 2910; Temporary Table 2915; and Game Record 2920.

Past Games Record 2820 is useful, for example, if a first game is interrupted and, after an interval, which may or may not be spent playing a second game, a visitor wishes to return to his first, interrupted game. For example, a child may be playing Zookeeper and may then be declared lost by a parent, teacher or guardian, at which point the child's Current Game is changed from Zookeeper to Lost Person. Once the child has been found (i.e. the End Game state of the Lost Person game has been reached) the Zookeeper game may be resumed.

Other uses of the Past Games Record include recording the level at which the visitor has been playing a particular game in order to perhaps assign the visitor henceforth to the next level; allowing a plurality of games to be defined as a sequence such that the visitor is "led" from game to game in accordance with the sequence; and allowing a user to temporarily leave the park and upon returning to the park, resume the game he left in the state he left it in.

Three examples of games are now described in Figs. 44 - 48 ("find lost person" game), Figs. 49 - 54B ("Zoo Keeper") respectively, and Figs. 55 - 60 ("tree quiz" game).

The "find lost person" game is now described with reference to Figs. 44 - 47.

Fig. 44 is a bubble diagram of a "find lost person" game.

Fig. 45 is a diagram of two "Visitor Record" data structures 2790 of Fig. 43A storing information regarding two respective visitors playing the "find lost person" game of Fig. 44. The bottom data structure is that of the searched-for person (typically a child) and the top data structure is that of the searching person (typically an adult). The visitor-characterizing information stored in the data structures of Fig. 45 preferably includes some or all of the following:

- a. Visitor's name, sex, age, level of skill for a selected game, and accent (to facilitate speech recognition).
- b. Game visitor wishes to play, the visitor's level of skill within the game (if game is multi-skill), the visitor's state from among the states in the state chart of the game, and the visitor's location in the park, i.e. the node with which the visitor is presently interacting or for which he is presently waiting.
- c. Group and sub-group affiliation, if the visitor is playing a group game. Typically, there is no specific field for defining sub-groups. Instead, a chain of parent group/s can be extended to form a complex tree. Typically, an entire chain of parent groups of parent groups of the current visitor is loaded.
- d. Credits earned by the visitor personally, or by the visitor's subgroup or group.
- e. The visitor's "game history", preferably including all games played by the visitor in the past, or all games played by the visitor in a predetermined window of time, and, for each such game, the date and time the game was played, the group to which the visitor belonged when playing that game, the level which the visitor reached when playing that game, and the current status of the game (terminated, paused).

Information regarding the game currently being played by the visitor is stored in Current Game Record 2840.

Attribute 3 in the visitor profile record 2800 of the searching person stores the visitor ID of the searched person. Attribute 2 in the visitor profile record of the searched person stores the visitor ID of the searching person.



It is appreciated that alternatively, the "find lost person" game can be played as a group game in which more than one person try to find a single lost person or more than one lost persons. In this case, attributes 2 and 3 store the names of the groups to which the searching and searched persons, respectively, belong.

Fig. 46A is a diagram of three "Game State Record" data structures of Figs. 43A - 43C storing information regarding the following three of the four respective game states within the "find lost person" game of Fig. 44: "start", "searching person" and "searched person".

Fig. 46B is a diagram of the fourth "Game State Record" data structure 2890 of Fig. 43A which stores information regarding the fourth of the four respective game states within the "find lost person" game of Fig. 44, namely the "end game" state.

Fig. 47 is a diagram of a "Node Record" data structure 2890 of Fig. 43A storing information regarding an individual node. For simplicity, the diagram includes only the information within the node's "Node record" data structure which is applicable to the "find lost person" game of Fig. 44.

Fig. 48 is a simplified flowchart illustration of a preferred chain of events which typically occur in setting up for and playing the "find lost person" game of Figs. 44 - 47.

The "find lost person" game may, for example, proceed as follows, as described in detail below with reference to Fig. 48:

- a. An adult who arrived at the amusement part of Fig. 33A - 33C accompanied by a child finds that the child has been separated from him.
- b. The adult approaches the central amusement park controller 2010. A human operator at the central amusement park controller 2010 initiates the "find lost person" game and is then prompted by the controller 2010 to stipulate the name of the person who is lost. The identity of the seeker is known to the controller 2010 by reading the adult's visitor ID off the badge of the adult who has arrived at the controller. The controller 2010 then retrieves the child's current location which is stored in the Current Location field of the child's Visitor Profile Record 2800, and instructs the adult to proceed toward that current location.

The controller 2010 then enters the following information into the database of Figs. 43A - 43C;

- i. Current Game field in the Visitor Profile Records of the adult and of the child receives the value "find lost person";
  - ii. Attribute 1 of Visitor Profile Record of child receives the value "searched person" and attribute 2 receives the visitor ID of the searching person (or group)
  - iii. Attribute 2 of Visitor Profile Record of adult receives the value "searching person" and attribute 3 receives the visitor ID of the searched person.
- c. The node at which the child is located (the "current location" node) completes the interaction with the player he is currently interacting with and (preferably before continuing on to the player next on line) informs the child that the adult is searching for him and requests that he stay at that node.
- d. The adult proceeds to the node which has been stipulated to be the current location of the child, however by the time the adult arrives at the node, the child may no longer be at the node. The adult may approach any node he encounters, including the node to which he was directed to proceed, and receive an update as to the current location of the child.
- e. Once the adult has approached the node which is the child's current location, he is so informed and the game terminates. If the adult finds the child at a location which is external to the vicinities of the various nodes, the game does not terminate until the adult and the child approach a node together at which point the node terminates the "find lost person" game and restores the adult and the child to the game they had previously played, at the game state they had previously been in. This information is available to the central node controller because the visitor records 2790 of the adult and of the child include a Past Games record 2820 which stores information regarding each game which the adult and child have played in the past.

Fig. 49 is a bubble diagram of a game for groups, "zoo-keeper", in which powers or credits are accumulated.

A group is defined as a set of visitors each of whom, of course, has a visitor record 2790 which includes a visitor profile record 2800 whose "group" field has a common value. Typically, each group has its own Visitor Record data structure 2790.

Typically, the credits accumulated by a group (i.e. accumulated by visitors belonging to the group, on behalf of the group) are stored in the Credits record 2830 of the Visitor record 2790 of the group (Figs. 50A and 50B) and are not stored in the Credits records 2830 of the individual visitors belonging to the group.

The Name field in the Visitor Profile Record of a group typically stores the same string as does the Group field of the Visitor Profile Record of each visitor belonging to that group.

It is possible to define a hierarchy of groups and subgroups, e.g. a school visits the amusement park and all pupils in the school form a group whereas all pupils in an individual class in the school form a subgroup. The Group field in the Visitor Profile Record of a subgroup stores the same string as does the Name field in the Visitor Profile Record of the group of which the subgroup is part.

Figs. 50A - 50E, taken together, form a diagram of 10 "Visitor Record" data structures of Figs. 43A - 43C storing information regarding seven visitors (Tony, Sara, Mark, Sheila, Frank, Barbara, and Dean) playing the group game of Fig. 48, the visitors being arranged into two sub-groups (A Team and Dragons), the two sub-groups defining a "main group" or "parent group" (Camp Oriole), wherein:

Fig. 50A comprises two "Visitor Record" data structures 2790 representing the main group, Camp Oriole, and one of the sub-groups (A Team) respectively;

Fig. 50B comprises two "Visitor Record" data structures 2790 representing the other of the sub- groups (Dragons) and one of the visitors, Tony, respectively;

Figs. 50C - 50E each comprise two "Visitor Record" data structures 2790 representing two of the visitors, respectively. Fig. 50C pertains to Sara and Mark, Fig. 50D pertains to Sheila and Frank, and Fig. 50E pertains to Barbara and Dean.

Fig. 51 is a diagram of a "Node Record" data structure 2890 of Figs. 43A - 43C storing information regarding a node, "deer", which is operating within the group game of Fig. 48.

Fig. 52 is a diagram of a "Game State Record" data structure of Figs. 43A - 43C storing information regarding one of the game states, "feed bear", within the group game of Figs. 49 - 51.

Fig. 53 is a diagram of another "Game State Record" data structure of Figs. 43A - 43C storing information regarding another of the game states, "feed deer", within the group game of Figs. 49 - 51. As shown, the Game State Record includes four condition sets, four corresponding action sets and four corresponding transitions. Therefore, in the "feed deer" game state, if any of the four conditions stipulated in Condition Sets 1 - 4 are fulfilled, then:

- a. the actions stipulated in the appropriate action sets from among action sets 1 - 4 are carried out; and
- b. the game moves into a different state as stipulated in the appropriate Transition from among Transitions 1 - 4.

For example, if (Condition 1) Credit = Bear Fed, i.e. if the player has already fed the bear, then the phrase "thank you very much for this delicious meal" is played, followed by the phrase "I will tell you a secret, the red clown knows how to pass the lions' gate" (Action Set 1). Then, the game moves from the Feed Deer state into the Red Clown state (Transition 1).

Figs. 54A - 54B are simplified flowchart illustrations of different aspects of a preferred chain of events including some of the events which typically occur in playing the "zoo-keeper" game of Figs. 49 - 53 and specifically, the events which occur while the "zoo-keeper" game is within its "Feed Deer" state.

A game called "tree-quiz" is now described, with reference to Figs. 55 - 60B, in which a node ask questions of visitors and/or give tasks to the visitors, as illustrated in Fig. 35. If the question is appropriately answered and/or if the task is completed, the same node or another node dispenses a prize, coupon or other valued item to the visitor. Preferably, as illustrated in Fig. 35, the node which dispenses the valued item physically extends the valued item toward the visitor and preferably hands the valued item to the visitor. Alternatively, as shown in Fig. 76, the coupon or other valued item is positioned such that the visitor extends his hand and takes the valued item. In Fig. 35, the tree 2170 asks a question and since the question is answered correctly by

the visitor 2210, the tree directs the visitor to proceed to clown 2160 to receive a present.

According to a preferred embodiment of the present invention, some or all of the nodes are actuated by insertion of coins, tokens or other credits into a suitable slot associated with the node and typically formed on the node. Alternatively, the player may be debited electronically for some or all node actuations. According to this alternative, the node recognizes the player and decrements a suitable field associated with that player and storing that player's balance, such as the Credit2 field in the Credits Record 2830 belonging to visitor Tonny Dunn, as illustrated in Fig. 50B.

Fig. 55 is a bubble diagram of a game for an individual, "tree-quiz", in which a prize or other token is dispensed to the individual player by one of the nodes in the amusement park.

Figs. 56A - B, taken together, form a diagram of one alternative "Game State Record" data structure of Figs. 43A - 43C, storing information regarding one of the game states, "ask question", within the individual game of Fig. 55.

Figs. 56A and 56C, taken together, form a diagram of another alternative "Game State Record" data structure of Figs. 43A - 43C, storing information regarding one of the game states, "ask question", within the individual game of Fig. 55. In Fig. 56C, each correct answer increments a counter filed in the Visitor Profile Record and each incorrect answer decrements the counter. This counter is available for several different games and enables the visitor to gain a point that can later be converted in a gift or coupon.

Fig. 57 is a diagram of two "Game State Record" data structures of Figs. 43A - 43C storing information regarding two additional game states, "record answer" and "give present", within the individual game of Fig. 55.

Fig. 58 is a diagram of two "Visitor Record" data structures of Figs. 43A - 43C storing information regarding two visitors playing the individual game of Figs. 55 - 57.

Fig. 59 is a diagram of a "Node Record" data structure of Figs. 43A - 43C storing information regarding a node, "tree", which is operating within the individual game of Figs. 55 - 58.

Fig. 60A - 60B, taken together, form a simplified flowchart illustration of a preferred chain of events including the events which typically occur in playing the "tree-quiz" game of Figs. 55 - 59.

A game called "common encounters" is now described, with reference to Figs. 61 - 69. In the illustrated embodiment, the "common encounters" game is initiated by the central node controller when a visitor approaches a node and the Game Name in the visitor's Visitor Profile Record indicates that the game does not require the visitor to approach that node. Alternatively, the cue for initiating the "common encounters" game is simply that key words such as "bathroom" or "help" are recognized in the speech of a visitor approaching the node, even if the contact between the visitor and the node is within the normal course of the game whose name is stored in the Game Name of the visitor's Visitor Profile Record.

Preferably, because the entire game is played between a single visitor and a single node, the Game Name and State Name fields in the visitor's Visitor Profile Record are not changed. Alternatively, the game in the visitor's Game Name field is suspended and Common Encounters is entered as a value to the visitor's Game Name field. After the Common Encounters game is terminated, the previous game and the last state reached in that game is resurrected from the Past Games Record and that previous game can then be resumed.

Fig. 61 is a bubble diagram of a game for an individual, "common encounters", in which a player makes a common comment or complaint or asks a common question such as "where are the restrooms" of one of the nodes in the amusement park and a suitable answer is provided to the individual player by that node;

Fig. 62 is a diagram of two "Game State Record" data structure elements of Figs. 43A - 43C storing information regarding two game states of the "common encounters" game of Fig. 61;

Fig. 63A is a diagram of a "Game State Record" data structure element of Figs. 43A - 43C storing information regarding a game state, "analyze", of the "common encounters" game of Fig. 61.

Fig. 63B is a diagram of two "Game State Record" data structure elements of Figs. 43A - 43C storing information regarding two respective game states, "provide information" and "record", of the "common encounters" game of Fig. 61.

Fig. 64 is a diagram of a "Node Record" data structure of Figs. 43A - 43C storing information regarding a node, "moving dog" 2140, which is operating within the game of Figs. 61 - 63;

Figs. 65A - 65B, taken together, form a play record data structure of an example of a play record operative to store oral and/or textual information to be played (i.e. orally presented) to a user who has asked for directions to the restrooms. Typically, a play record also includes information other than that which is to be orally presented to the user such as information defining expressions, gestures or other physical acts which are to accompany the oral presentation of the information.

Figs. 65A - 65B mention the following 5 voice files containing sound information which may, for example, include representations of the following phrases:

VR03025.wav "THE RESTROOMS ARE"  
VR03120.wav "IN FRONT OF ME AND"  
VR03121.wav "BEHIND ME AND"  
VR03122.wav "TO MY RIGHT"  
VR03123.wav "TO MY LEFT"

Fig. 66 is a diagram of 2 "Frequent inquiry record" data structures of Figs. 43A - 43C storing information regarding two frequently posed inquiries: "where is the bathroom" and "please clean the bathroom".

Fig. 67A is a simplified flowchart illustration of a process that suspends a game. Fig. 67B is a simplified flowchart illustration of a process that resumes a game. In Fig. 67A a game is suspended, suitable details documenting the state of the game when suspended are copied to a Past Game Record 2820, and a new game is set and loaded. In Fig. 67B, the latest suspended game is resumed using the Past Game Record 2820 defined for that game.

Fig. 68A is a simplified flowchart illustration of a first preferred chain of events including all operations performed by the central node controller 2010, on behalf of a node approached by a player in the course of playing a "common encounters" game of Figs. 62 - 66 provided in accordance with a first preferred embodiment of the present invention.

Fig. 68B is a simplified flowchart illustration of a preferred method by which the central node controller effects the "analyze keywords" step of Fig. 68A.

Fig. 68C is a simplified flowchart illustration of the "compute total weights" step of Fig. 68B.

Fig. 69 is a simplified flowchart illustration of a second preferred chain of events including all operations performed by the central node controller 2010, on behalf of a node approached by a player in the course of playing a "common encounters" game of Figs. 62 - 66 provided in accordance with a second preferred embodiment of the present invention.

Fig. 70 is a simplified flowchart illustration of a preferred method for playing speech and simultaneously appropriately moving at least one body part so as to provide an appropriate physical expression or demeanor. The method of Fig. 70 is suitable for implementing any of the "play" steps shown and described herein such as steps 3600 and 3645 of Fig. 68A or step 3050 in Fig. 48. In the Fig. 70, the "lypsync" file includes a temporal string of commands that implements a movement of the mouth in synchronization with the spoken syllables, as is known in the art.

Fig. 71 is a simplified block diagram of a preferred hardware implementation of node control device 2214 of Fig. 36 which is suitable for a node whose connection to the central node controller comprises a wireless connection. A suitable implementation of Fig. 71, in schematic block diagram form, are Figs. 7A - 7F.

Fig. 72 is a simplified block diagram of a first computer board which, in conjunction with the computer board of Fig. 73, comprises a preferred implementation of the computer-node interface of the central node controller 2010 of Fig. 33B, for wireless applications.

Fig. 73 is a simplified block diagram of a second computer board which, in conjunction with the computer board of Fig. 72, comprises a preferred implementation



of the computer-node interface of the central node controller 2010 of Fig. 33B, for wireless applications.

Fig. 74 is a simplified block diagram of a preferred hardware implementation of node control device 2214 of Fig. 36 which is suitable for a node whose connection to the central node controller comprises a cable connection.

Fig. 75 is a simplified block diagram of circuitry which comprises a preferred implementation of the computer-node interface of the central node controller of Fig. 33B, for cable applications in which nodes are connected via cables to the central node controller 2010 of Fig. 33B. Element 4390 may, for example, comprise a Viper806 and element 4395 may, for example, comprise a TEK 857, both commercially available from Teknor Industrial Computers, Inc., 7900 Glaes Road, Boca Raton, FL 33434, USA.

It is appreciated that in order to increase the number of nodes which the central node controller 2010 is capable of supporting, a number of board pairs such as a suitable number of the board pairs illustrated in Figs. 72 - 73 and/or a suitable number of the board pairs illustrated in Fig. 75 can be provided.

Fig. 76 is a pictorial illustration of a node 4420 which is operative to dispense an item of value to a player and specifically to print coupons and dispense them to players in accordance with control instructions, arriving from the central node controller, which determine differential entitlement of different players.

Fig. 77 is a pictorial illustration of a node 4430 which is operative to interact physically with a player and specifically to sense at least one physical, non-verbal aspect of a player's performance of a task which typically forms part of a game and to provide an evaluation thereof to the central node controller.

Fig. 78 is a pictorial illustration of a plurality of nodes such as animals and trees participating in various games played by a plurality of visitors 4440 - 4449. The players and nodes participating in a first game are encircled by imaginary circle 4500. The players and nodes participating in a second game are encircled by imaginary circle 4510. The players and nodes participating in a third game are encircled by imaginary circle 4520. As shown, each player typically plays only one game at a time, however at least some of the nodes participate in more than one simultaneously ongoing games. For

example, lion 4480 participates in all three games and therefore is included in the intersection of circles 4500, 4510 and 4520. It is appreciated that, of course, the geographic areas including the players and nodes involved in various games are not generally configured as overlapping circles and that the circles shown in Fig. 78 are imaginary circles showing relationships between games being played and nodes and players participating in those games.

For at least some nodes, such as node 4452, there is a queue of visitors playing different games. For node 4452 the queue includes a first visitor 4443 playing the first game (corresponding to circle 4500) and a second visitor 4447 playing the second game (corresponding to circle 4510).

The node controller 2010 (not shown) is preferably operative to assign each player including the illustrated players 4440 - 4449 to an individual game such as one of the three games corresponding to the three circles 4500, 4510 and 4520. Preferably, a player playing an individual game interacts with each of the nodes participating in that game. For example, preferably, visitor 4441 interacts with all of the nodes included within circle 4500. The players playing the same game (such as the 4 players 4446 - 4449 playing the game corresponding to circle 4520) may each be playing in a different state of the game.

The node controller is also preferably operative to control each individual node such that when the individual node enters into an interaction with an individual player, the node plays, with the individual player, the game assigned to that individual player. For example, node 4460 plays the first game (the game corresponding to circle 4500) with visitor 4441. Thereby, the nodes can sequentially participate in any of a plurality of games being played simultaneously by any of a number of players and at least one node, and preferably many or even all nodes, participates in each of at least two ongoing games.

The games may include group games in which at least one encounter between an individual player of the group game and a node participating in the group game is affected by at least one previous encounter between at least one other player of the group game and that node or some other node. For example, the game corresponding to circle 4510 may be a group game and visitors 4443, 4444 and 4445 may all be

members of a single group. A game may be played as a competition between two competing groups. For example, game 4520 may be played as a competition between first and second competing groups, the first comprising visitors 4446 and 4447 and the second comprising visitors 4448 and 4449.

Fig. 79 is a simplified flowchart illustration of a preferred method for computing the Direction function stored in the Begin field of the Play Record of Fig. 65A, as a function of a pointing node (Parameter 1) and a target node (Parameter 2), wherein Direction represents the direction in which a visitor must proceed in order to move from the pointing node to the target node.

Figs. 80A - C, taken together, form a simplified flowchart illustration of a preferred method by which a node can suggest a new game to a visitor who approaches the node and who is not playing any game.

Fig. 81 is a simplified flowchart illustration of a preferred procedure followed by a human attendant servicing an entrance to the park and for registering new visitors to the park.

It is appreciated that the software components of the present invention may, if desired, be implemented in ROM (read-only memory) form. The software components may, generally, be implemented in hardware, if desired, using conventional techniques.

It is appreciated that various features of the invention which are, for clarity, described in the contexts of separate embodiments may also be provided in combination in a single embodiment. Conversely, various features of the invention which are, for brevity, described in the context of a single embodiment may also be provided separately or in any suitable subcombination.

It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather, the scope of the present invention is defined only by the claims that follow which are:

**Appendix A****Central Node Controller Software Principles of Operation****1. Introduction**

Unlike all other game systems, Creator's Multinode system supports three features that are each unique and furthermore unique as a combination:

1. Each game can be distributed over several "entertainment nodes".

Therefore, a player can, and should, travel between the nodes to proceed with the game. The travel, that is, which node the player chooses to approach next, may affect the development of the game.

2. Each entertainment node can support many games concurrently.

Each of these games is shared with (distributed among) several other nodes and each node plays one or more parts of the game. Each of these games is normally played by a different player. The players play with the node one at a time, one (different) part of their personal games every time. The node identifies each player automatically and loads and plays the appropriate part of the appropriate game. At any time, any node will react to any player, personally, even if that node has nothing to do with the game, or the state of the game, that the player currently plays.

3. Many players can play many games with many nodes at the same time. All games are always available on all relevant nodes. There is no need to terminate or suspend one game (played by one player) to play another game (played by another player).

There can be more players than nodes since some of the playing time is spent on travel between the nodes. Even where there is queuing, since the play time of each part of the game is short and since there may be several nodes capable of playing the same part of a game, queue time at each node will be very short.

Games can be played in groups so that one player playing one part of the game affects other players playing other parts of that game.

Results of one game can be ported and affect other games, or prizes provided by other games.

## **2. Concepts, Entities, Relations**

### **2.1. Games and States**

A game is made of a network of states.

Each state is made of "associations". Each association is made of one condition set, one action set and one transition:

A condition set is a Boolean phrase of several conditions.

An action set is a list of actions associated with a condition set.

A transition points to another state (or to the same state) and is associated with a condition set and an action set.

When a state is entered the list of condition sets is analyzed. When a condition set is found where all the conditions are fulfilled, the associated set of actions is executed. The list of actions is scanned "top down" which represent the order of priority of the associations. At the end of the list there is always a default condition with its action set (may be null) and transition (may be to the same state, e.g., waiting loop).

The action set is a group of action items to be performed. The action set is executed until it is done or until another condition set, that is associated with a preemptive action and is of a higher priority, is fulfilled. Each action item may have parameters according to its type. Some actions may involve the setting of such parameters for future actions.

Transition may occur anywhere from the point an action set is launched and until it is done. The transition launching instruction (rather than the transition pointer discussed above) is an action within the action set. (For "dissociation" see below in "multi-node games".)

### **2.2. States and Nodes**

Each state is associated with a "node of interaction".

Nodes of interaction may be implemented in physical figures or as virtual entities.

A game may be implemented in one node or distributed over several nodes.

Consequently, each node may have many states of different games, some may be initiated and completed within the same node and some may be parts of games distributed over several nodes.

### **2.3. Multi-Node Games**

When a node participates in a multi-node game it may host “disconnected states”.

Therefore, when a transition to another state occurs it also means a transition to another node. Hence the player has to advance that other node to continue the game.

A node participating in a multi-node game may also have sets of states (or sub games) where several states are connected and played within the same node and then the game continues in another node.

Multi-node games may have “diversions”. A diversion occurs when the player can continue the game by moving from the current node to more than one other node. e.g., the player can select the next node to continue. The diversion is a “meta-state” that is associated with more than one node. The transition from the current state is made to the diversion state and when the player approaches one of the possible nodes the (proximity) condition in the diversion state is fulfilled and there is a transition to the appropriate state associated with the approached node.

When a player approaches a node that is not associated with the next state it is responded accordingly. This response (action) is associated with a “dissociation” condition and with a “self” transition (to the same state). Dissociation is an association of condition-action-transition that is mandatory in each state of a multi-node game. It contains the action that must be carried by a node that is not associated with the current (pending) state. There may be several dissociation for different types of nodes and situations.

### **2.4. Classes of Nodes**

A state is always associated with a specific node. Therefore the player must approach the correct node to proceed with the game. Sometimes several nodes may serve this purpose. For example, when they are indistinguishable like trees in a forest or when they belong to a well-defined group like the mammals or each of the seven dwarfs of Snow-white. Therefore nodes can be grouped in classes and a state can be associated with a specific class. A node can be a member of several classes within the same game and within different games.

### **2.5. Nodes and Actions**

The actions in an action set can be invoked in sequence when they apply to the same peripheral or in parallel when they apply to different peripherals. For examples, sound files (such as speech sentences) are played in sequence, but in parallel to motion of the lips, eyes and hands. Motion of the hand can be executed in parallel to the sensing of a switch in the finger. The action set is therefore a pointed graph of parallel (concurrent) sequences of action items.

Typically action items have templates. There are basic action templates for each type of peripheral and more advanced action templates for types of figures in which the peripheral is installed. There are action templates for figures for each game in which the figure takes part. Combined action templates where one action item operates several peripherals (e.g., speech and lipsync). Action templates for node classes. Action templates for storing parameters in the memory for future use according to the structure of the game (e.g., "gaining power"), etc.

### **2.6. Multi-Node Actions (Class Action)**

A game may require two nodes acting in the same time in response to the fulfillment of a certain condition. To achieve this an action can be defined for a node class. The "class action" will be executed by all nodes that are members of that class concurrently. The central computer (that executes all of the game program code for all game programs) sends the relevant action commands to all nodes that are members of that node class. Class action items are based on class action templates that are combined action templates for several nodes. These nodes can be the same node types (e.g., trees), different node types (e.g., dog and cat) or same type performing differently (e.g., twin clowns in a feud).

### **2.7. Games, Nodes and Players**

Basically a game is played by each player independently. Many players can play the same game or different games within the same environment using the same nodes. When a player approaches a node the node loads the visitor's record from the main database. (It is the main computer that process all the program code needed to perform the activities that are presented here as node activities. However, since all node activities are

performed in virtual concurrence it is easier to present it as if the node itself performed the game code).

According to the content of the visitor's record the node loads the game that the player is playing at that time and locates the state of the game that the visitor is currently playing. The node then analyzes the condition sets and performs the necessary actions and transitions (whether the current state involves the current node or not).

Therefore each player plays his or hers game independently of all other players. There is therefore a "program game" that is shared by all the players of the same game and a "played game" that is the individual, independent game played by each of the players of the same program game.

## **2.8. Multi-Party Games**

A multi-party game involves several players in the same "played game". The players can share the same interest (and cooperate), can compete with each other, or can be grouped in two or more competing groups. For a multi-party game the participants in the same played game are defined (in their player records) as members of the same "players group". In a multi group game, each player is defined as a member of a sub-group and the sub-group is defined as a member of a players group. The players defined within a sub-group cooperate to compete with other sub-groups within the same players group. Groups and sub-groups have database records similar to individual players. These records host parameters (achievements, constraints, requirements, etc.) for that "individual" sub-group and group. A condition set of a state of a multi-party game may involve parameters from the individual player, sub-group (if so defined) and group (default) records. Several players groups can play the same game(or different games) within the same environment (nodes) at the same time.



### **3. Programming**

There are two modes of programming: game scripting and knowledge acquisition. There are three levels of scripting tools: Basical, Visual and Graphical:

#### **3.1. Basical**

The most basic tool is a third generation programming language. This is an extension of the well-known Basic programming languages enhanced with special functions. This method is widely used in macro programming languages of popular software packages such as Word from Microsoft, Lotus 123 from Lotus, etc.

#### **3.2. Visual**

The next programming tool is a windows-like user interface. This tool enables the programmer to select and open well designed programming windows and there select functions and their possible parameters from various types of "drop down menus" and selection boxes. This method relieves the programmer from the need to learn and remember all possible functions, their parameters and the syntax of the programming language. Each such selection represents an expression of the basic programming language. The skilled programmer can still enter the macro programming window and create special macro routines that are otherwise unavailable. These macro routines can be then used as additional options in the appropriate pull down menus and windows.

#### **3.3. Graphical**

The highest level is a graphical programming tool. This tool presents the various entities as interrelated graphical images such as icons connected by arrows that are marked by special symbols. This method clearly displays to the programmer the relations between the various objects in the program that is very difficult to comprehend using the other tools. The programmer can:

- Add more objects via click, drag and drop from the objects toolbar.
- Relate the object to one another or change relations via arrows and similar connecting symbols, also from the objects toolbar.
- Double click an object to open the relevant window for Visual programming.

### **3.4. Knowledge Database**

In a well-designed game state the player is limited to very few and well-defined possible actions. If none of these actions is recognized the player is thought to be in error and the game redirects the player towards the correct action. In certain situations the player may perform many variations of the expected actions. In other situations there is no specific action that is expected from the "player". For example, when a visitor requests general help in a verbal manner. In such a case the node records the player speech and speech recognition is performed. The system then matches the identified speech items against a knowledge database. The system then plays (through the same node) a phrase that is associated with the best match.

There are two means for programming the knowledge processing engine:

- Loading more associations of "visitors' actions" and "system responses". This is typically done by logging the assistance provided to visitors by human attendants. The most frequent visitor's requests are associated with their typical responses and with the various manners that visitors have expressed their request. These associations are loaded into the knowledge database in the manner that best suits the algorithm for identifying (matching) the visitor's expression with the typical request.
- Programming the analyzing and matching algorithm of the knowledge processing engine to increase the rate of correct identification of the visitor's request.

(See also Knowledge Discovery in the Dialog Databases chapter below)

#### **4. Processing**

All the processing is executed by the main computer. The main computer runs a multi-tasking operating system (such as Unix, Windows NT, etc.). Each node has its own main task that controls its behavior at all times and without interruptions. There is a dedicated, continuous, communication channel between the computer and each node to support the continuous controlling functions. In certain situations the Main Node Task invokes other tasks to perform parallel operations such as playing or recording of voice, speech recognition, etc. The main computer may use peripheral processing equipment for specialized missions such as high power DSP boards for speech recognition, sound compression, video capture, etc. Additional tasks support the system operators (see below), background administration, resource management, inter-task coordination and general system monitoring.

Many other tasks are also operative in the background to perform park-wide processes such as

More tasks are operative to support regular computer terminals available to human operators or

## **5. Data Structures**

There are three main entities in the system: visitors, nodes and games. There are several other data structures to manage the content provided by the nodes to the visitors.

### **5.1. Visitors' Data Structures**

The main data structure is the visitor record. The Visitor Record is made of four entities, each is implemented as a separate record: Visitor Profile Record is the main record and the other four records are associated with it by means of the Visitor ID field. The other records are: Credits Record, Current Game Track Record and Past Game Record.

The Credits Record contains all the credits accumulated by the visitor and effective. The record typically contains the fields: Visitor ID, Game Name and the list of credits for that game. The Game Name and its credits can be repeated.

The Current Game Track Record is a log of the activity of the visitor within the current game as is useful to determine the future progress of the game. The record typically contains the fields: Visitor ID, Game Name and the list of Game States in the chronological order at which they occurred.

The Past Game Record contain essential information about games played by the visitor in the past. It is useful to suggest new games or to resume games that were suspended for various reasons. Each past game has a record and therefore there may be several such records for each visitor. Each such record typically contains the fields: Visitor ID, Game Name, Level at which the game was played, Status of the game or reason for termination, The Game State at which the game was terminated. The Date and the Time at which the game was terminated.

Visitor Record, Group Record, and Sub-group Record are the same structure. The Group field in the record defines the relation: The field may identify the record to represent a user (e.g. have zero value) or contain the name of the parent group (or sub-group).

The "family tree" is virtually infinite since any sub-group can be the parent group of another sub-group. However, every visitor must belong to some group. Individual players belong to the default INDIVIDUALS group. As in a common directory tree of a

file system, the identifying names of visitors and sub-groups must be unique within the same parent group but can be the same if in different groups.

Several fields in the data structure are identical. For example the game field. In such case the child data overrides the parent data. The parent data serves as the default (or template) values when a new child record is opened. In other cases the parent data serves as a fall-back option. For example, when a player finishes a game he or she may “fall-back” automatically to the group “game” that can direct them to the point of gathering.

### **5.2. Nodes' Data Structures**

Nodes are made of three entities, each entity is implemented as a separate record:

The Node Figure entity that defines in details the mechanical and electronical features of the node. For example a tree, a cow or a clown having a speaker a microphone, a moving limb, a flashing light, etc. Virtual nodes do not have physical entity.

The Node Feature entity that describes the performance characteristics of the node. This is helpful to relieve the programmer from stating a different behavior for each possible node that may perform the specific action of the game. For example: the programmer can instruct the node to play a specific phrase. The node will perform the playing of the phrase according to its characterization, e.g. young bear, old duck, weird clown as specified in its feature record.

The Node Profile entity that describes a specific node having a specific Figure and a specific Feature and several other specific values such as location.

### **5.3. Games' Data Structures**

Games consist of one main entity, the Game State record. States are made of three main entities: Conditions, actions and transitions. For each transition there is a set of action and a set of conditions. For ease of handling by the computer, condition sets and action sets are also data entities implemented in independent data structures.

### **5.4. Play Data Structures**

The Play Data Structure is a list of pre-recorded sound files and text files. The text files are used for Text-to-Speech conversion into playable speech. Each Play record contains

an identifier, a sound or text file and a list of expression parameters. The expression parameters characterize the content of the voice or text file such as funny, serious, mysterious, informative and accompanying gestures such as synchronized lipsync file, eye motion, hand motion, etc. The parameters provided by the Play Record are interpreted by the functions provided by the Node Feature Record to adapt to the capabilities of the specific node.

## **6. Scripting**

Scripting is the programming of condition sets and action sets. Scripting can be done in all three programming tools: Basical, Visual and Graphical. Basical is the most powerful tool but requires programming knowledge while Graphical is the easiest and most intuitive but relatively limited tool.

### **6.1. Condition Scripting**

A condition set is a Boolean query sentence.

### **6.2. Action Scripting**

Action set is a list of actions organized in sequences. Actions in sequences are performed one after the other while sequences are performed in parallel. The initiation of a sequence may depend on the completion of an action in another sequence executed in parallel. To coordinate the execution of sequences a sequence may begin with an ON action. The ON action tests a certain condition one or more fields. The ON action should not be confused with a condition set though the scripting is the same. The fields of the ON action are modified by other actions in other sequences using the SET action.

### **6.3. Animation**

Typically, each node is capable of various motions, gestures, facial and verbal expressions. For example: body, head and hands gestures, facial expressions such as smile, eye brows motion, eye lighting, etc. verbal intonation and lipsync, etc. The expressions available to the node are presented in the Node Feature Record.

The expressions and the motions of a node in a specific situation may be explicitly expressed as a part of the actions to be performed or may be indirectly and automatically derived from other accumulating parameters associated with the interaction with the visitor. There are two sources for these parameters: special SET actions that set the parameters in the list of Local Parameters of the Game State Record and expression parameters that are part of the Play database. These parameters are continuously analyzed and processed to provide input to the node feature functions in the Node Feature Record. These functions interpret the input data provided by the expression processing algorithm, adapt it to the capabilities of the specific node and convert it to

physical signals that operate the node's limbs. For example, automatic generation of lipsync is performed using SpeechSynch toolkit from Lernout & Hauspie, Belgium. As always, all this is performed by the task in the central computer that is responsible to operate the specific node.

Expression parameters are stored in the Local Parameter fields of the Game State Record. An expression parameter includes the expression type and its value. The parameters are transferred to the next Game State Record or initialized in each new state. The default action (transfer or initialize) is normally stated at the Game Start state but can be modified in any state.

Typically, a SET action will either increase the value of a certain parameter type or add a new parameter type (with an initialization value) if this parameter type does not exist yet at that game state.

Typically, an EXPRESSION command instructs the task that manages the specific node that performs the specific game state to invoke all Feature functions in the Node Feature Record that are associated with the performance of expressions. Each of the Feature functions scans the Local Parameter fields of the Game State Record for expression types it is capable of performing. The Feature function loads the value of the relevant parameters into the function and decrements the value of the Local Parameter field.

This mechanism enables the following:

- The creator of the game is relieved from the details of each node. The programmer creates the game and sets the emotions. The node takes care of the performance of the expressions.
- A game state may be performed by different types of nodes with different physical capabilities and different "emotional" characteristics. The same emotions will be realized in different expressions by different nodes.
- Emotions can be transferred from state to state and hence from node to node. This creates a sense of continuity and game development to the player.



## **7. Operations**

### **7.1. The Control Center**

All the activities of the nodes and the games are processed by the computer center. The computer center has a control center manned with operators. The operators are able to display in textual and in graphical modes each and every record. This means that an operator can display the exact situation of any played game, any node and any player. The operator can also display a trace record for each played game, each node and each player.

An operator at the control center can initiate direct communication with any node and remote control the node's activity. For example the operator can initiate verbal communication with a person located by a node through the node's speaker and microphone.

Some nodes are equipped with an "emergency button". Pressing this button causes an alarm message to be displayed on the operators' screens. The operator can then immediately locate that node and initiate direct communication with the person besides it.

### **7.2. The Visitors Center**

The Visitors Center is an annex of the control center and is used to register visitors. Registration incorporates filling in the visitor's/player's record. This includes the detailed of the individual, his or hers group and sub-group associations and the game to be played.

To enable fast registration of groups it is possible to define temporary player template that includes the more constant fields (such as group, sub-group, age, accent, etc.). An easy solution is to enable the option of opening "NEW AS" record that includes all field values as in the previous record and the cursor is positioned in the first field that was modified in the previous screen.

## 8. Main Data Structures

### 8.1. Visitor Record (Number 2790 in Fig. 43A)

Each visitor/group has a Visitor Record that consists of: Visitor-Profile-Record, Past-Games-Record, Credits-Record and Current-Game-Track-Record.

#### 8.1.1. Visitor Profile Record (Number 2800 in Fig. 43A)

The Visitor Profile Record contains:

|                  |                                                                                                                                                                                      |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name             | The private name of the visitor                                                                                                                                                      |
| Surname          | The family name of the visitor or the name of the group                                                                                                                              |
| Group            | The name of the parent group of the visitor or the group                                                                                                                             |
| Sex              | The visitor gender                                                                                                                                                                   |
| Age              | The age, or age group of the visitor                                                                                                                                                 |
| Accent           | The visitor's accent parameters for speech recognition                                                                                                                               |
| Visitor ID       | Unique ID of the visitor (or group) that links the Visitor-Profile-Record with other associated records such as the Past-Games-Record, Credits-Record and Current-Game-Track-Record. |
| Level            | Level of competence of the visitor                                                                                                                                                   |
| Badge ID         | Unique ID of the locating and identifying badge wore by the visitor                                                                                                                  |
| Current Location | Where the visitor is located                                                                                                                                                         |
| Current Game     | The name of the game currently played by the visitor                                                                                                                                 |
| Current State    | The name of the state of the game currently played by the visitor                                                                                                                    |
| Attributes       | Data fields used to carry information regarding the visitor other than in the Credits Record                                                                                         |

#### 8.1.2. Credits Record (Number 2830 in Fig. 43A)

The visitor's Credit Record contains information about credits acquired by the visitor while playing a specific game. The Credit Record contains the Visitor ID that links it to the Visitor Profile Record, the name of the game for which the credits were received and a list of the credits.

**8.1.3. Past Game Record (Number 2820 in Fig. 43A)**

The visitor's Past Games Record contains information about games played by the visitor (other than the current game). The Past Games Record contains the Visitor ID that links it to the Visitor Profile Record, the name of the game, the Level at which the game was played, the status and the Game State at which the game was paused or terminated.

**8.1.4. Current Game Track Record (Number 2840 in Fig. 43A)**

The Current Game Track Record stores a log of the activities of the visitor while playing the game. The log contains the Visitor ID that links it to the Visitor Record Profile, the game name and the list of states traversed by the player in the chronological order in which they occurred.

Some games can be played in various patterns, that is, the player can accumulate the necessary credits through different states, different nodes or different order of travel between the same nodes. The Current Game Track Record enables the system to select the next state based on the past development of the specific game played by the specific player.

**8.2. Node Record (Number 2890 in Fig. 43A)**

Each node has a Node Record that consists of: Node-Profile-Record, Figure-Record and Feature-Record, Class-list-Record.

The Node-Profile-Record (Number 2850 in Fig. 43A) stores the data pertaining to the specific node.

The Figure Record (Number 2860 in Fig. 43A) describes the physical characteristics of the node (e.g. contains a moving hand, etc.) or a class of physically identical nodes.

The Feature Record (Number 2870 in Fig. 43A) describes the animation characteristics of the node (e.g. sound pitch, speech rate) or a class of nodes that are similar from their behavior aspect but may be different from their physical aspect.

Class-list-Record (Number 2880 in Fig. 43A) Stores the list of classes with which the specific node is associated.

### 8.3. Game record

Game records (Number 2920 in Fig. 43C) are used to allocate a game to a visitor according to his age, level, credits and games that he already played. This information can be used by the attendant at the visitor's care center at the central amusement park controller, or, automatically, by any node that the visitor approaches when the Current Game field in his Visitor profile Record is blank.

The Required Credits and the Required Past Games fields provide conditions to the allocation of the game to the visitor. This conditions are provided as Boolean expressions such as:

"(Credit-7 and Credit-13) or (Credit-2 and Credit-60)"

"(Game-18 and Game-403 and Game-221) or game 13"

Credits can be points, prizes, honorary titles, tokens, weapons, coupons and money.

Money credits can be deposited at registration and debited by any node or game state. Play Record

A play record is used each time a node has to output sound, including voice, speech, etc. The play record includes a pointer to one or more sound files, text files for text-to-speech conversion and may also include instructions for playing the sound, such as sound effects, facial and body expressions, conditions on the performance of some of the voice files. This enables the Game State Action that contains the Play Action to adapt to the characteristics of each node.

### 8.4. Frequent Inquiry Record (Number 2910 in Fig. 43B)

When in "Common Encounters" a visitor's request is recorded the words that were spotted by the speech recognition are compared with the keywords in the Frequent Inquiry Records. The Frequent Inquiry Records are scanned and the total weight of all spotted keywords is calculated for each record (and can be stored in the temporary table). The record with the highest weight is selected and the associated answer phrase is played to the visitor.

## 9. Typical Games

Figure 78 shows three games: 4500, 4510 and 4520.

Game 4500 can be played with several nodes: elephant nodes 4502 and 4504, deer nodes 4450 and 4452, bear nodes 4460 and 4462 tree nodes 4470 and 4472 and lion node 4480.

Game 4510 can be played with the nodes: deer node 4452, bear node 4462 tree node 4476, cow nodes 4490, 4492, 4494 and lion node 4480.

Game 4520 can be played with the nodes: elephant nodes 4506, 4508, deer nodes 4452, 4454, tree nodes 4472, 4474, and lion nodes 4480, 4482, 4484.

The games are distributed over their respective nodes so that to play game 4500 a visitor will travel and play with all or some of the nodes 4502, 4504, 4450, 4452, 4460, 4462, 4470, 4472 and 4480.

Three visitors 4440, 4442 and 4444 are playing now game 4500, each with another node. Each visitor is playing independently. Each visitor is playing in a different state of the game.

Lion node 4480, tree node 4472 and deer node 4452 can provide games 4500 and 4520. Deer node 4452 and bear node 4462 can provide games 4500 and 4510. Lion node 4480 and deer node 4452 provide games 4510 and 4520.

The lion node 4480 and the deer node 4452 can provide the three games 4500, 4510, and 4520.

Each node can support several visitors concurrently, providing them with his part in each games he supports, one visitor at a time. Visitor 4444 and visitor 4442 are now at bear node 4462. Visitor 4444 is now playing a state of the game associated with a bear node and visitor 4442 is now waiting for his turn to play with this node.

The following are examples of four games. Some of the examples below should be termed activities since the term "game" is inappropriate.

### 9.1. Lost Person Game

When one or more individual is searching for another individual the control center can do three things:

1. Spot and display (textually and graphically) the node with which the lost person is, or was last, interacting.
2. Change the searched person's player record so that "game" is equal to "Lost Person" and "Group" is equal to the ID of the searching person and a credit is equal to "Searched Person". This will cause any node with which the searched person will interact (or is interacting) to present the searched person with a message such as "<searched person name>, you are being searched by <searching person name>, please do not move from this place".
3. Change the searching persons' player records so that "Game" is equal to "Lost Person" and "Group" is equal to the ID of the lost person a credit is equal to "Searching Person". This will cause any node with which a searching person will interact to direct him or her to the node where the searched person is, or was last, located. This may be done by providing a message such as "<searching person's name>, <searched person name> is located at the bear just behind me and to your left".

As is obvious that the "game" itself is very simple. There are only two states, both associated with the node class "all nodes". One of the states applies to the searched person and the other applies to the searching person. Both states have two transitions: one "self transition" (back to the same state) and the other transition to "end game". The condition for the self transition is "none" and the actions are providing the messages described above. The second transition occurs when both players are located in closest proximity to the same node. The "Lost Person" game grants all its players the highest priority at all nodes.

Lost Person Game has four states.

State 1 determines which state should be processed for the participant:

Searching Person state or Searched Person state.

- State 2 is processed until the searched person is found. Each node processing this state will inform the searching person the current location of the searched person.
- State 3 is processed until the searched person is found. Each node processing this state will inform the searched person that he is searched and requests him to stay at that location.
- State 4 terminates the game.

### 9.2. Zoo Keeper Game

Each bubble represents a state of the game (a Game State Record) and each arrow represents a transition. Each transition has a set of conditions, that if fulfilled, initiates a series of actions that includes a transition to another state. Sometime the transition can terminate at the same state. The game ends when the visitor (or group of visitors) reaches the End-Game state.

### 9.3. Tree Quiz Game

The game Tree Quiz asks the visitor a verbal question, and, if the visitor answers correctly, the tree gives him a prize. The game has five states:

1. Tree Quiz start
2. Ask Question Play a question, e.g. "You get a prize if you tell me what makes my leaves green, Chlorophyll or Hydrochloric acid?" If the visitor's answer, as determined by the Get an Answer state, is correct, proceed to Give Prize state. If the answer is incorrect, decrement the difficulty level (Visitor-Profile-Record.Level) and ask another question until the level reaches zero. Optionally (Fig. 56C) the game increments a counter for correct answers and decrements the counter for incorrect answers. This counter is maintained while the visitor continues his travel through the park, from node to node and from game to game.
3. Get an answer Record the visitor response, execute speech recognition, check if the answer contained the required keyword (Chlorophyll).

- 4. Give Prize      Sends the visitor to the clown to collect a prize.
- 5. End-Game      Terminates the game

#### 9.4. Common Encounters Game

Common Encounters game can provide answers to frequently asked questions. The game can be played by any node capable of speaking and recording voice. The game has six states:

- 1. Start Game      The node identifies a visitor that is not playing a game or that the game played is not associated with that node.
- 2. Ask question    The node suggests help and proceeds to Get Answer state by playing "How can I help you?"
- 3. Get Answer      The node records the visitor's response to the node's microphone, until the recording time is over, then proceeds to the Analyze recording state.
- 4. Analyze Recording    The node executes speech recognition on the recorded sound (optionally the speech recognition can be executed while the recording is performed). Then the node compares the spotted words with the keywords in the Frequent Inquiry Records. The node calculates the total weight of all spotted keywords for each Frequent Inquiry Record and the record with the highest weight is selected.
- 5. Provide Information    The answer phrase associated with the selected Frequent Inquiry Record is played to the visitor. The game proceeds to Ask Question state.
- 6. End-Game      The game terminates when the visitor is satisfied with the information provided or when the visitor is no longer at that node.



## 10. Location and Direction Pointing

The location data of each node and visitor consists three elements:

|                   |                                                                                                                                                                                        |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cell location     | Identifies the cell in which the node or visitor is currently located, in Cell ID values, normally as AA01 to ZZ 99 where the AA to ZZ denotes X axis and the 01 to 99 denotes Y axis. |
| Absolute Location | Identifies the absolute location of the node or the visitor, in X and Y coordinates measured in meters with respect of an absolute triangulation point.                                |
| Facing Angle      | Identifies the absolute angle the node or visitor is currently facing, in degrees, relative to the North (facing north = 0°, facing south = 180°.)                                     |

There are two functions that, when executed, return the location of a node or visitor:

The **Location** function returns the absolute location of the target object while the **Direction** function returns the relative location of the target object to the pointing object.

### Locating

The Location function receives the name of the target object and returns the cell location, the absolute location (X,Y values) and the facing angle (if known).

Location ( Target\_Object\_Name , Cell\_Location , X\_location , Y\_Location ,  
Facing\_Angle)

### Pointing Direction

Direction to a target can be presented in two ways:

1. Absolute cell location (cell ID) of the target. (this is simple but quite coarse).
2. Polar direction (angle and distance) relative to the pointer.

Sometimes it is best to give both values, e.g. "cell CB17, in front of me and to my right."

The absolute location of a target object is received by means of the Location function described above. The relative direction is received by means of the Direction function described below.

### The Direction Function

The Direction Function receives the name of the pointing object and the target object and returns the relative distance, angle and positioning from the pointing object to the target object.

Direction ( Pointing\_Object\_Name , Target\_Object\_Name ,  
Relative\_Distance, Relative\_Angle, Position\_Front , Position\_Side)

#### **Calculating Relative Direction to a Target**

1. Calculate the relative Cartesian position:

$$X_{\text{direction}} = X_{\text{target}} - X_{\text{pointer}}$$

$$Y_{\text{direction}} = Y_{\text{target}} - Y_{\text{pointer}}$$

Where X and Y are the values of the absolute location of the target and the pointer respectively.

2. Calculate the distance to the target

$$\text{Distance} = \text{SQRT}(X_{\text{direction}}^2 + Y_{\text{direction}}^2)$$

3. Calculate the absolute angle to the target

$$\text{Absolute\_Angle} = \text{ATAN}(X_{\text{direction}} / Y_{\text{direction}})$$

4. Calculate the relative angle to the target

$$\text{Relative\_Angle} = \text{Absolute\_Angle} - \text{Facing\_Angle}$$

5. Determine "relative body direction" values

Relative body direction are used when the pointer is unable to provide, or the directed person can not understand exact angular information (which is the most common situation). In this case the relative angular direction will be given as "in front of me and to my right". This requires that the space around the pointer is divided into eight sections: Front, Front & Right, Right, Behind & Right, Behind, Behind & Left, Left, Front and Left. These values are given as two digits, the first denotes front/back and the second denotes right/left, as follows:

|                 | Front | Right | Relative Angle   |
|-----------------|-------|-------|------------------|
| Front           | 1     | 0     | 337.5° to 22.5°  |
| Front & Right   | 1     | 1     | 22.5° to 67.5°   |
| Right           | 0     | 1     | 67.5° to 112.5°  |
| Behind & Right  | -1    | 1     | 112.5° to 157.5° |
| Behind          | -1    | 0     | 157.5° to 202.5° |
| Behind & Left   | -1    | -1    | 202.5° to 247.5° |
| Left            | 0     | -1    | 247.5° to 292.5° |
| Front and Left. | 1     | -1    | 292.5° to 337.5° |

## **11. Knowledge Discovery in the Dialog Databases**

Creator has defined a method that enables a Creator application system to become increasingly competent in use of its knowledge database over time, thereby enabling its robot guides to respond with increasing contextual and logical appropriateness to user questions/comments. The developed method achieves this high performance level by "growing" the system's knowledge database and the set of algorithms used to derive responses. The method involves identifying new queries on an ongoing basis, absorbing the new queries into the database and, on a daily basis, inputting new, appropriate responses to the new queries and new and modified parameters.

The method is based on the principle that over a defined period of time, over the course of daily use of the system, the most commonly asked questions and comments and most of their variants will surface. By accumulating this data and properly categorizing it, as well as refining the system's mechanisms for producing responses, the system can achieve a highly functional dialog capability relatively quickly.

### **1.1. Overview**

At the core of the method are efficient mechanisms that quickly evaluate the input to determine whether it matches or is akin to existing data; this approach, by "separating the wheat from the chaff," establishes early on which data will make a contribution to the database. This daily maintenance approach—or perhaps better called "daily nurturing approach"—enables the database to be expanded in breadth and depth on a daily basis, all the while improving the system's ability to respond appropriately when in interactive dialog with users. Creator expects its dynamic database approach to produce a database that furnishes 70% appropriate responses after 5 months of operation and 80% appropriate responses after 1 year of operation.

The knowledge database and its related mechanisms serve the entire Creator system: all robot guides connected to the system access the same database and use its mechanisms to generate responses. This knowledge network is the very reservoir of each robot's "intelligence" and the human-like dialog it is capable of conducting.

The method incorporates existing knowledge, new knowledge added over the course of natural use of the system, defined parameters, KDD (Knowledge Discovery and Data Mining) strategies, and fuzzy logic algorithms.

The robot guide formulates answers/comments by applying a set of rules to a set of accumulated data. The set of accumulated data consists of:

- **User's current question/comment**
- **Existing general database**
- **User's individual database.** This database is begun when the user first registers with the system (for example, upon entering the theme park) and is updated dynamically as the user interacts with the system (for example, during the current visit to the theme park and during subsequent visits). An individual's database contains different information about the user, such as: age, sex, all questions previously asked by the user, native language, preferred topics of conversation, how many times has visited). The user wears an ID badge throughout the visit; this badge is automatically "read" by the robot guide when the user passes by. The robot then gains a wealth of knowledge about the user that it takes into account when engaging in dialog and providing answers to the user's questions.

The rule mechanism that operates the database consists of:

- **Previously defined parameters**
- **KDD strategies**
- **Set of fuzzy logic algorithms**

## **1.2. The Method at Work**

Creator's method for "growing" the knowledge database and related algorithms is outlined briefly below.

### **1.2.1. Initialization of the Knowledge Database**

These activities take place prior to the beginning of system operation.

1. **Initial data entered.** Core input consisting of 1,000 - 10,000 questions/comments and corresponding responses is prepared and entered. This data forms the core database.

2. **Parameters defined and entered.** These parameters stipulate the guidelines for evaluating whether a sentence is a question and what type of question, for determining how closely a word matches one or more other words, for determining the subject of the sentence (taking into account the subject that appeared in previous sentences in the same dialog), and more. Each parameter is assigned a percentage, which determines how heavy an impact the parameter has (among all the parameters) in the evaluation of a word, phrase, or sentence.

### 1.2.2. "A Day in the Life" of a Creator Knowledge Database

These activities take place on a daily basis, from the first day the system is operated.

1. **User poses question/makes comment.**
2. **Fast search conducted.** (From start of operation.) Creator uses a specially developed search engine that automatically and quickly checks each user question/comment to see if it matches existing data.
3. **Individual database accessed.** After identifying the user by reading his/her badge, the system taps into the user's individual database prior to supplying a response and, as appropriate, incorporates personal information into the response.
4. **System provides response.** The system generates the most appropriate response to the existing data. If no appropriate response exists, the system provides a "sidestepping" response that shifts the dialog in another direction.
5. **Voice recognition tool activated.** This tool assigns nearness percentages of new data to existing data.
6. **Fuzzy logic and AI algorithms operated.** The set of algorithms consists of transformational grammar and other language-based rules. The algorithms use the most recently defined parameters to analyze the data to determine its format, subject, meaning, context, and more, omit unnecessary words, count the number of known words in the sentence, and perform other tasks. The algorithms automatically catalog the new, analyzed data into subject and context, and add the data to the existing database. Note: The algorithms take a global approach: once they establish that certain words do not contribute to meaning or context and can be omitted, such words will be automatically omitted from like sentences added in the future.

- 7. Responses and parameters updated.** At the end of each day, system experts review all new data. New responses are prepared and entered and parameters are modified as necessary to take into account the newly acquired information. For example, percentages determining a parameter's weight may be altered in light of the day's input.

**AI development tools are available from:**

Brightware Inc. Novato, Calif. (800) 532-2890

**Knowledge Discovery and Data Mining software tools are available from**

Thinking Machines Corporation, 14 Crosby Drive, Bedford, MA 01730, 617-276-0400

**Machine Learning Library in C++ MLC++ is available from**

Silicon Graphics, Inc, 2011 N.Shoreline BLVD., MTN. View CA 94043-9711

**Tools for training backprop neural nets is available from**

California Scientific Software, 10024 Newtown rd, Nevada City, CA, USA

**Engineering environment for neural network design is available from**

The Math Works, 24 Prime Park Way, Natick, MA USA

**Information Discovery software tools - IDIS is available from**

Information Discovery, 703B Pier Avenue, Suite 169, Hermosa CA 90254

**Decision tree, statistics and fuzzy reasoning software tools - TETRAD II - is available from**

Lawrence Erlbaum Associates, Hillsdale, NJ, USA

**Expert Systems, Trees and Nodes diagram development tools - EXSYS RuleBook is available from**

Multilogic, 1720 Louisiana BLVD NE Ste 312 Albuquerque, NM 87110

**Defining goals and constraints, and providing them with relative importance weights -Fuzzy Decision Maker , is available from**

Fuzzy Systems Engineering, 12223 Wilsey Way, Poway CA 92064

**Neural Network Tool for neural network learning and automatic generation of a fuzzy expert system rulebase, and software tools that support unsupervised competitive learning, supervised competitive learning, differential competitive learning and a Fuzzy-C development System and a Fuzzy programming language**

**tool and a fuzzy-rule-based expert system- FuzzyCLIPS development tool are available from**

**Ortech Engineering Inc., 17000 El Camino Real #208, Houston, Texas 77058**

## **12.**

### **Game State Record**

|                        |                                                                                                                                                    |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Game Name</b>       | <b>Zoo Keeper</b>                                                                                                                                  |
| <b>State Name</b>      | <b>Feed Deer</b>                                                                                                                                   |
| <b>Node Name</b>       | <b>Class Deer</b>                                                                                                                                  |
| <b>Condition Set 1</b> | <b>Credit = Bear Fed and<br/>SCAN(Current-Game-Track-Record(Visitor-ID), State, Feed-<br/>Deer)</b>                                                |
| <b>Condition Set 2</b> | <b>Credit = Bear Fed</b>                                                                                                                           |
| <b>Condition Set 3</b> | <b>Credit = Blue Clown and<br/>SCAN(Current-Game-Track-Record(Visitor-ID), State, Feed-<br/>Deer)</b>                                              |
| <b>Condition Set 4</b> | <b>Credit = Blue Clown</b>                                                                                                                         |
| <b>Condition Set 5</b> | <b>Group.Credit = Deer Fed and<br/>SCAN(Current-Game-Track-Record(Visitor-ID), State, Feed-<br/>Deer)</b>                                          |
| <b>Condition Set 6</b> | <b>Group.Credit = Deer Fed</b>                                                                                                                     |
| <b>Condition Set 7</b> | <b>Default</b>                                                                                                                                     |
| <b>Action Set 1</b>    | <b>Play "Go to the red clown and ask him how to pass by the lion"</b>                                                                              |
| <b>Action Set 2</b>    | <b>Play "Thank you very much for this delicious meal"<br/>Play "I will tell you a secret, the red clown knows how to pass the<br/>lions' gate"</b> |
| <b>Action Set 3</b>    | <b>Play "Go find horse food and bring it to the horses in the horse<br/>race."</b>                                                                 |
| <b>Action Set 5</b>    | <b>Play "Go to the Blue clown and ask him where to proceed".</b>                                                                                   |
| <b>Action Set 6</b>    | <b>Play "Thank you very much for this delicious meal"<br/>Play "I will tell you a secret, a sad clown knows your way"</b>                          |
| <b>Action Set 4</b>    | <b>Play "Sound the horns, send the dogs,"</b>                                                                                                      |



**WO 99/08762**

**PCT/IL98/00392**

|                     |                   |
|---------------------|-------------------|
| <b>Transition 1</b> | <b>Red Clown</b>  |
| <b>Transition 2</b> | <b>Horse Food</b> |
| <b>Transition 3</b> | <b>Blue Clown</b> |
| <b>Transition 4</b> | <b>Feed Bear</b>  |

## CLAIMS

We claim:

1. Amusement park apparatus comprising:
  - a first plurality of entertainment providing nodes playing a second plurality of games with a third plurality of players who are simultaneously playing said second plurality of games;
  - a node controller operative to assign each player from among the third plurality of players to an individual game from among the second plurality of games and operative to control each individual node from among said first plurality of nodes such that when the individual node enters into an interaction with an individual player, the node plays, with the individual player, the game assigned to said individual player; and
  - a communication network operative to associate each of said first plurality of nodes with said node controller.
2. Amusement park apparatus comprising:
  - a first plurality of entertainment providing nodes each operative to sequentially participate in any of a second plurality of games being played simultaneously with any of a third plurality of players;
  - a node controller operative to control said first plurality of nodes; and
  - a communication network operative to associate each of said first plurality of nodes with said node controller.
3. Amusement park apparatus comprising:
  - a first plurality of entertainment providing nodes;
  - a node controller operative to control said first plurality of nodes to play a second plurality of games such that at least one of the first plurality of nodes participates in each of at least two ongoing ones of said second plurality of games; and
  - a communication network operative to associate each of said first plurality of nodes with said node controller,

4. Apparatus according to claim 3 wherein said node controller is operative to control said first plurality of nodes so as to accommodate a third plurality of players participating in at least two ongoing ones of said second plurality of games.
5. Apparatus according to claim 1 wherein said second plurality of games comprises at least one group game in which at least one encounter between an individual player of the group game and one of said first plurality of nodes is affected by at least one previous encounter between at least one other player of the group game and at least one of said first plurality of nodes.
6. A system for dispensation of infotainment, the system comprising:
  - a multiplicity of lifesize fanciful figures distributed in a crowd-accommodating area in which infotainment services are dispensed to a crowd;
  - a central fanciful figure controller operative to provide at least some of said infotainment services to the crowd by controlling said multiplicity of fanciful figures; and
  - a communication network operative to associate each of said multiplicity of fanciful figures with said central fanciful figure controller.
7. A system according to claim 6 wherein said crowd-accommodating area comprises an amusement park and said infotainment services comprise amusement park services.
8. A system according to claim 6 wherein at least a portion of the crowd-accommodating area comprises an outdoor area.
9. A system according to claim 6 wherein said multiplicity of fanciful figures includes a plurality of stationary figures.
10. A system according to claim 6 wherein said multiplicity of fanciful figures includes at least one mobile figure.

11. An information providing system comprising:
  - a multiplicity of information providing nodes each including at least one sensor, other than an alphanumeric input device, for sensing events in its vicinity;
  - an interactive central node controller operative to receive an indication of an event from an individual one of said information providing nodes and to control another one of said multiplicity of information providing nodes in accordance with said indication of said event; and
  - a communication network operative to provide communication between each of said multiplicity of nodes and said central node controller.
12. A system according to claim 11 wherein said nodes are distributed in a crowd-accommodating area.
13. A system according to claim 11 wherein said at least one sensor comprises an artificial vision system for sensing visual information in its vicinity.
14. A system according to claim 11 wherein said at least one sensor comprises an audio reception system for sensing audio information in its vicinity.
15. A system according to claim 14 wherein said audio reception system comprises a speech recognition unit.
16. Apparatus according to claim 6 wherein said multiplicity of fanciful figures comprises at least one talking figure.
17. Apparatus according to claim 16 wherein said at least one talking figure emits pre-recorded speech specimens.
18. Apparatus according to claim 16 wherein said at least one talking figure emits synthesized speech.

19. Apparatus according to claim 16 wherein said at least one talking figure assembles pre-recorded speech segments, thereby to emit speech.
20. Apparatus according to claim 16 wherein said at least one talking figure assembles synthesized speech segments, thereby to emit speech.
21. A system according to claim 11 wherein said information providing nodes include moving parts which are visible to a user.
22. A system according to claim 11 wherein said central node controller is operative to cause said information providing nodes to take actions having known significance.
23. A system according to claim 22 wherein said actions having known significance comprise smiling, pointing and illuminating.
24. A system according to claim 11 wherein said sensor is capable of identifying an individual in its vicinity and wherein said central node controller is operative to record the nodes which each individual has encountered.
25. A system according to claim 24 wherein at least some of said information providing nodes are operative to provide an individual with information whose contents take into account the individual's past encounters with nodes of the system.
26. A system according to claim 24 wherein at least some of said information providing nodes are operative to provide an individual with information whose contents take into account other individuals' past encounters with nodes of the system.
27. A system according to claim 6 wherein at least some of said fanciful figures include a commodity dispenser.

28. A system according to claim 27 wherein said commodity dispenser is operative to dispense at least one of the following articles: gifts, prizes, coupons, refreshments, maps, souvenirs, change, tokens.

29. A system according to claim 11 wherein at least some of said information providing nodes are operative to provide an individual with information whose contents take into account at least one characteristic of the individual.

30. A two-way user servicing system comprising:  
a multiplicity of game-playing nodes each including a user identity receiving device for identifying presence of an individual user;  
an interactive central node controller operative to receive from a particular node an indication of the presence of a particular user at said particular node and to control participation of at least one of said multiplicity of game-playing nodes in at least one game in accordance with said indication; and  
a communication network operative to provide communication between each of said multiplicity of nodes and said central node controller.

31. A system according to claim 30 wherein said node controller is operative to maintain, for at least one particular user, a record of nodes said particular user has visited and to control at least one node currently visited by said user in accordance with said record.

32. A system according to claim 30 wherein said user identity receiving device comprises a user identity input device.

33. A system according to claim 30 wherein said user identity receiving device comprises a user identity sensing device.

34. A system according to claim 30 wherein said user identity sensing device comprises a receiver for sensing a user-identifying transmission sent by a wearable tag.
35. A two-way game system comprising:  
a multiplicity of game participant nodes each including a user identity receiving device for identifying presence of an individual user;  
an interactive central node controller operative to receive from a particular node an indication of the presence of first and second users at said particular node and to instruct said particular node to play a first game with said first user, to play a second game with said second user; and  
a communication network operative to provide communication between each of said multiplicity of nodes and said central node controller.
36. Apparatus according to any of the claim 21 wherein said information providing nodes comprise at least one infotainment providing node.
37. A method of providing entertainment, the method comprising:  
providing a first plurality of entertainment providing nodes playing a second plurality of games with a third plurality of players who are simultaneously playing said second plurality of games;  
providing a node controller operative to assign each player from among the third plurality of players to an individual game from among the second plurality of games and operative to control each individual node from among said first plurality of nodes such that when the individual node enters into an interaction with an individual player, the node plays, with the individual player, the game assigned to said individual player; and  
networking each of said first plurality of nodes with said node.
38. A method of providing entertainment, the method comprising:  
providing a first plurality of entertainment providing nodes each operative to sequentially participate in any of a second plurality of games being played

simultaneously with any of a third plurality of players who are simultaneously playing said second plurality of games;

controlling said first plurality of nodes; and

networking each of said first plurality of nodes with said node controller.

39. A method of providing entertainment, the method comprising:  
providing a first plurality of entertainment providing nodes;  
controlling said first plurality of nodes to play a second plurality of games such that at least one of the first plurality of nodes participates in each of at least two ongoing ones of said second plurality of games; and  
networking each of said first plurality of nodes with said node controller.

40. A method of providing entertainment, the method comprising:  
distributing a multiplicity of fanciful lifesize figures in a crowd-accommodating area;  
controlling said multiplicity of fanciful figures centrally; and  
networking each of said multiplicity of fanciful figures with said central fanciful figure controller.

41. A method of providing information, the method comprising:  
providing a multiplicity of information providing nodes each including at least one sensor other than an input device for sensing events in its vicinity;  
interactively and centrally receiving indications of said events from said information providing nodes and controlling said multiplicity of information providing nodes in accordance with said indications of said events; and  
providing networked communication between each of said multiplicity of nodes and said central node controller.

42. A method of providing two-way user servicing, the method comprising:  
providing a multiplicity of game-playing nodes each including a user identity receiving device for identifying presence of an individual user;



interactively and centrally receiving from a particular node an indication of the presence of a particular user at said particular node and controlling participation of at least one of said multiplicity of game-playing nodes in at least one game in accordance with said indication; and

providing networked communication between each of said multiplicity of nodes and said central node controller.

43. A method of providing two-way gaming, the method comprising:  
providing a multiplicity of game participant nodes each including a user identity receiving device for identifying presence of an individual user;

interactively and centrally receiving from a particular node an indication of the presence of first and second users at said particular node and instructing said particular node to play a first game with said first user, to play a second game with said second user; and

providing networked communication between each of said multiplicity of nodes and said central node controller.

44. Apparatus according to claim 2 wherein said second plurality of games comprises at least one group game in which at least one encounter between an individual player of the group game and one of said first plurality of nodes is affected by at least one previous encounter between at least one other player of the group game and at least one of said first plurality of nodes.

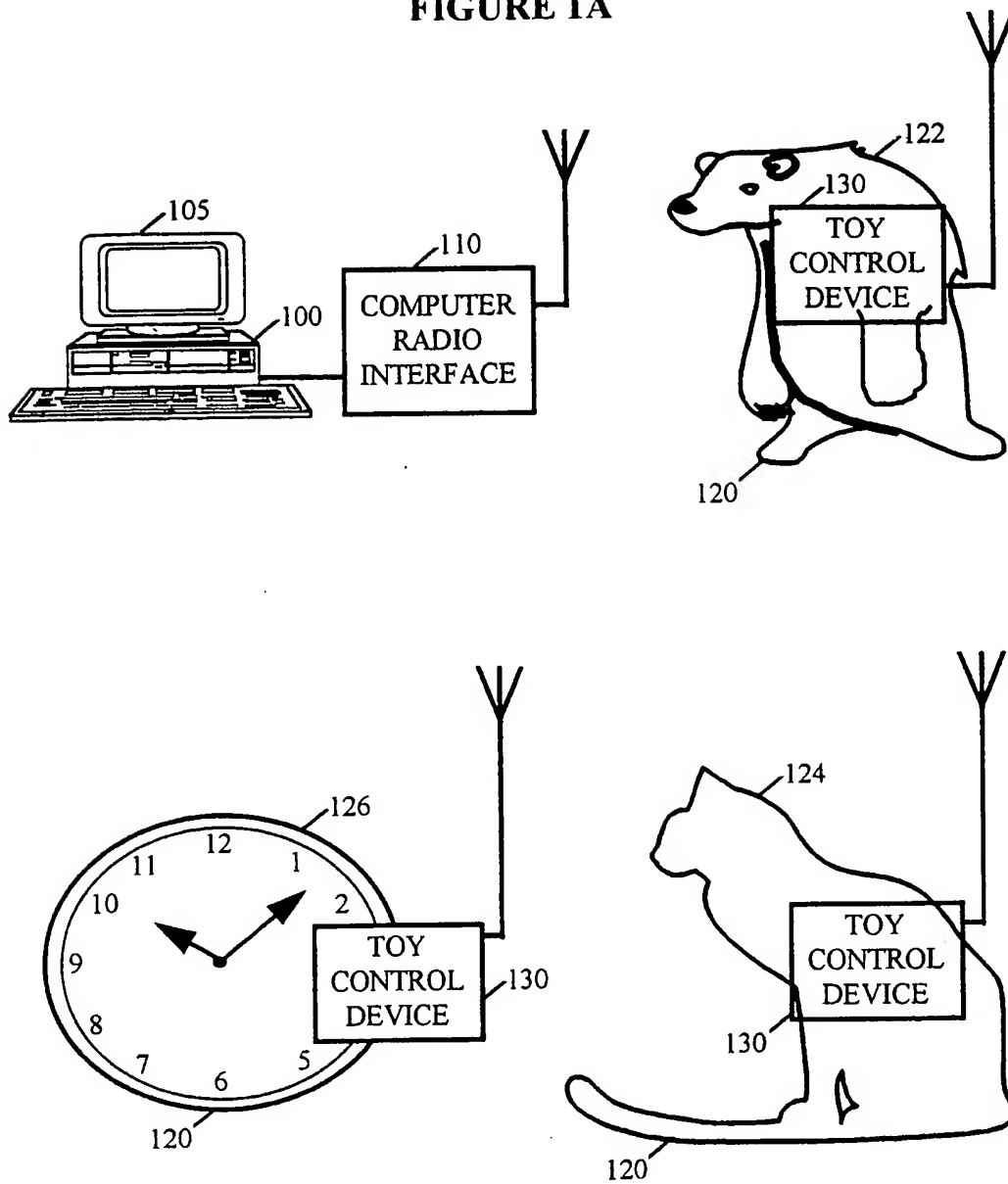
45. Apparatus according to claim 3 wherein said second plurality of games comprises at least one group game in which at least one encounter between an individual player of the group game and one of said first plurality of nodes is affected by at least one previous encounter between at least one other player of the group game and at least one of said first plurality of nodes.

46. Apparatus according to claim 4 wherein said second plurality of games comprises at least one group game in which at least one encounter between an individual

player of the group game and one of said first plurality of nodes is affected by at least one previous encounter between at least one other player of the group game and at least one of said first plurality of nodes.

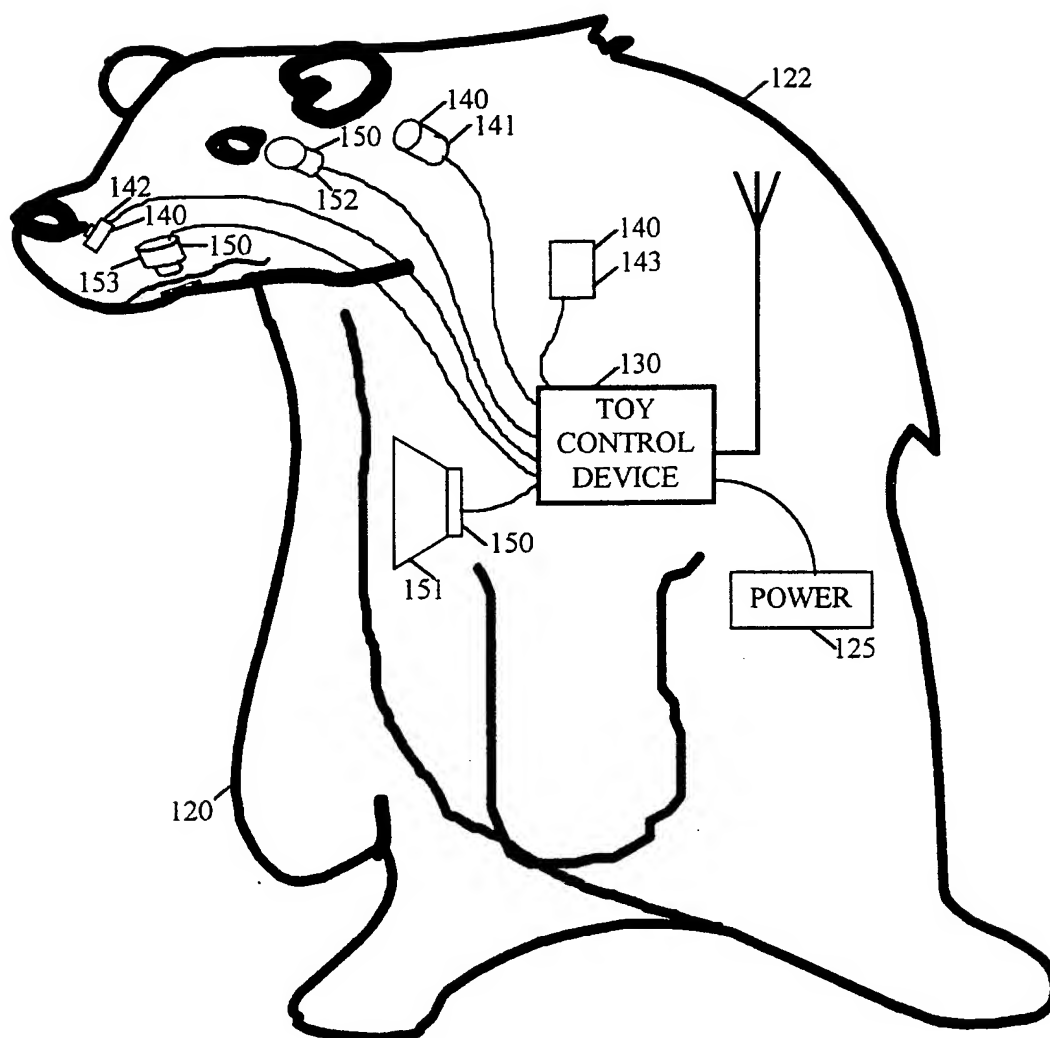
1/192

FIGURE 1A



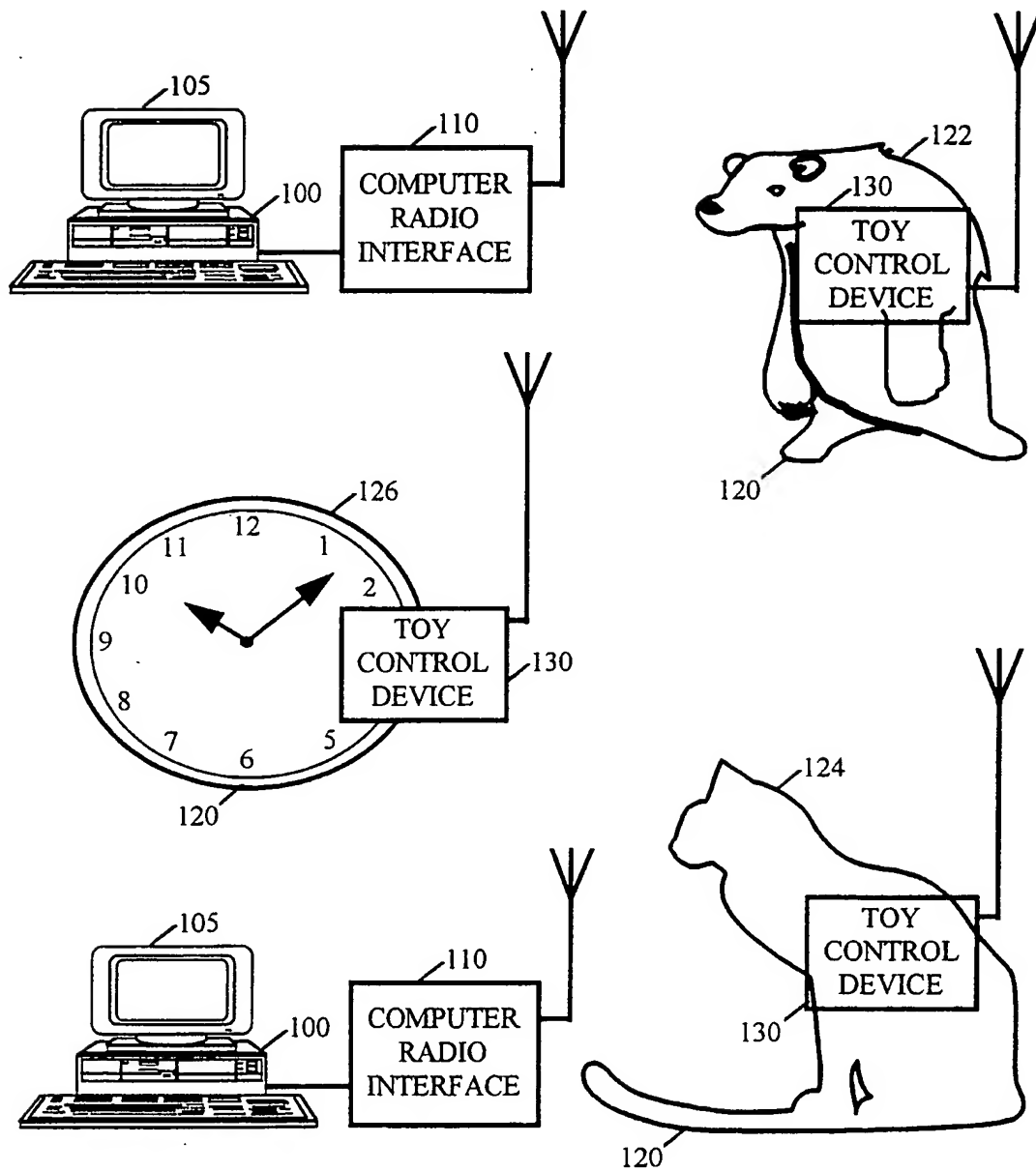
2/192

FIGURE 1B



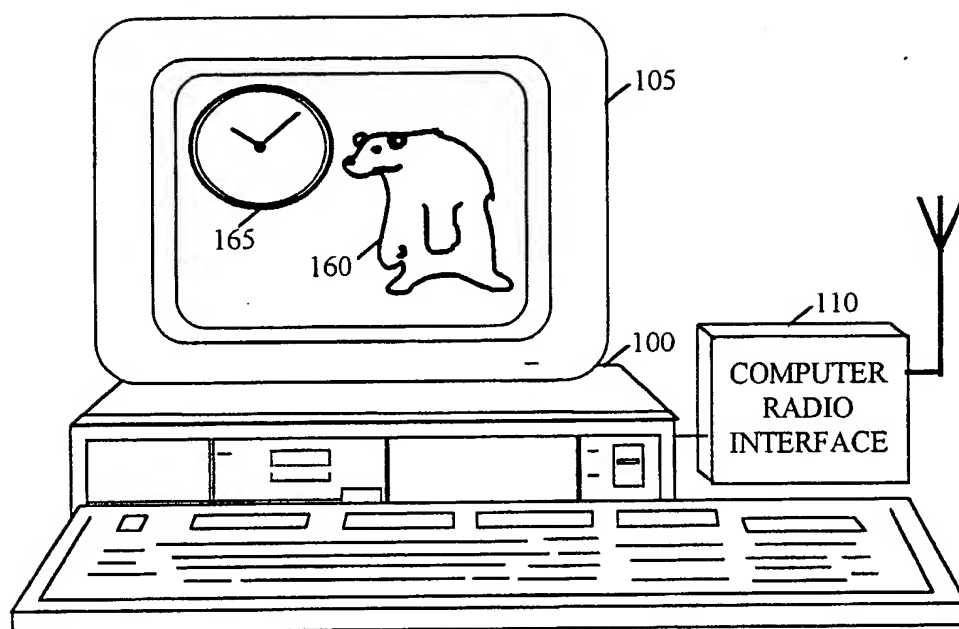
3/192

FIGURE 1C



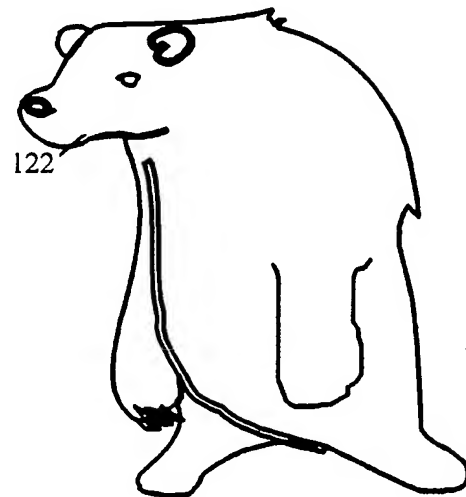
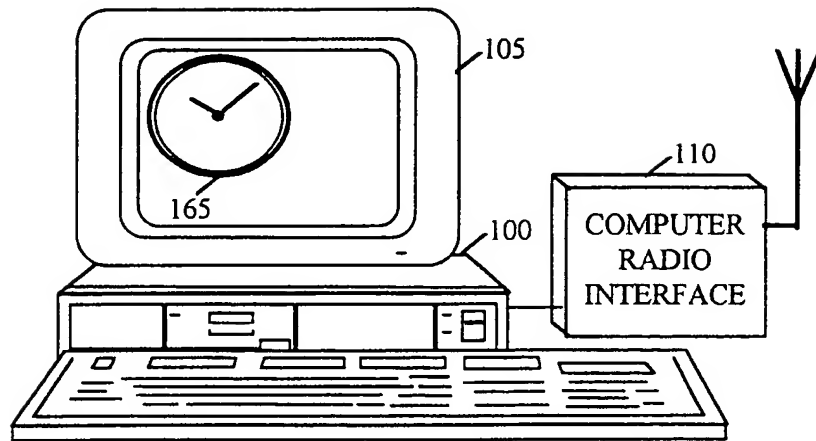
4/192

FIGURE 2A



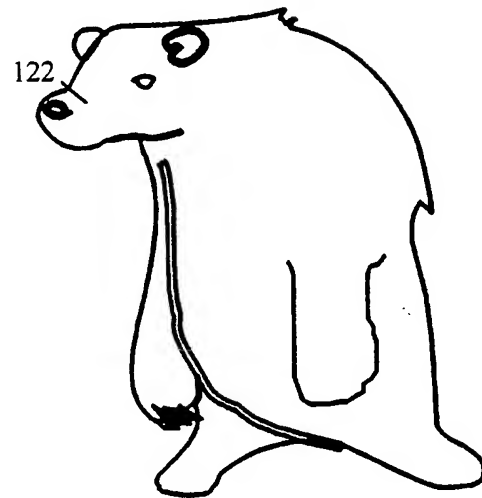
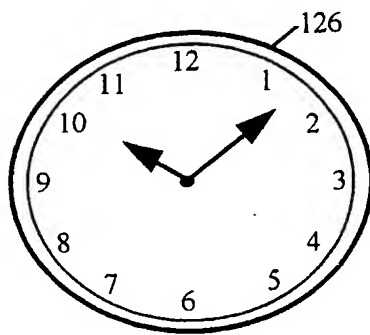
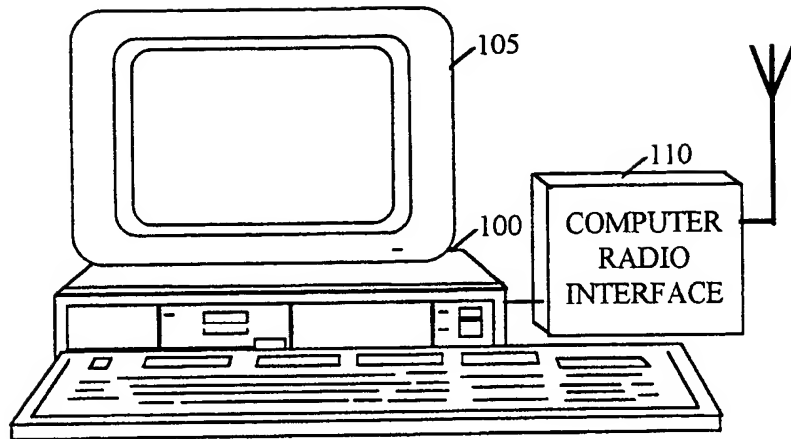
5/192

FIGURE 2B



6/192

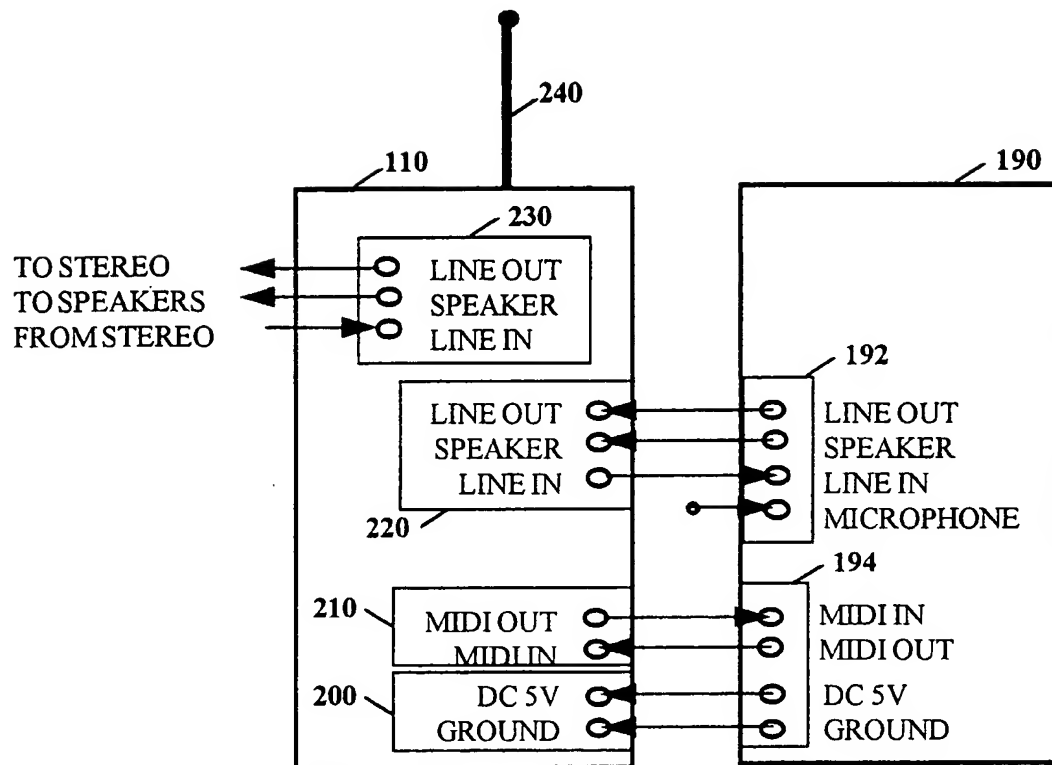
FIGURE 2C





7/192

FIGURE 3



8/192

FIGURE 4

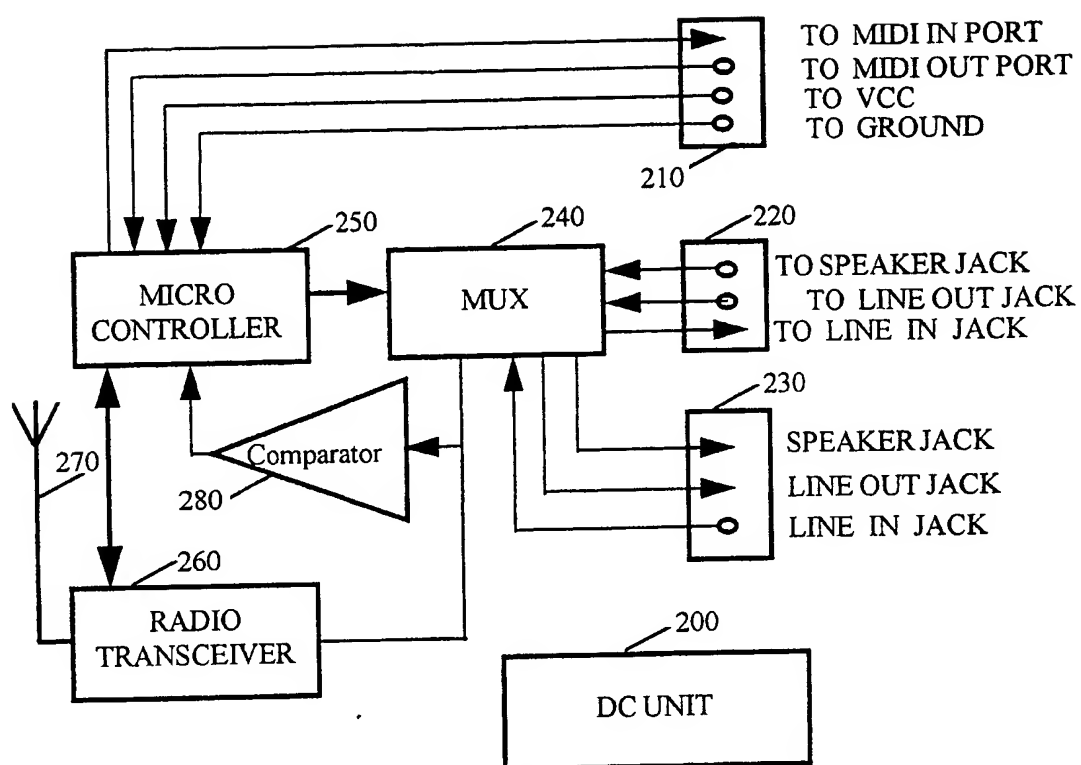
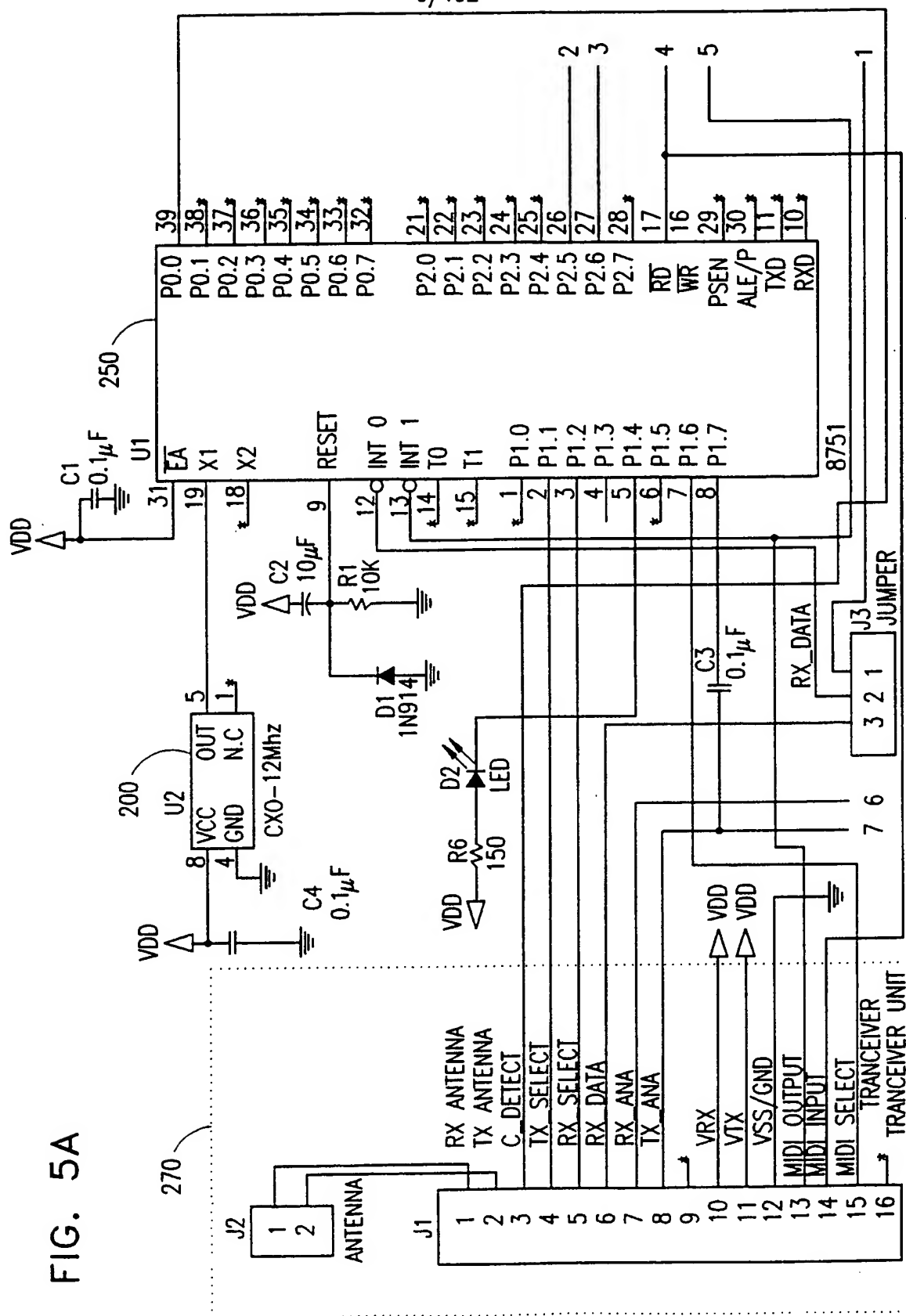
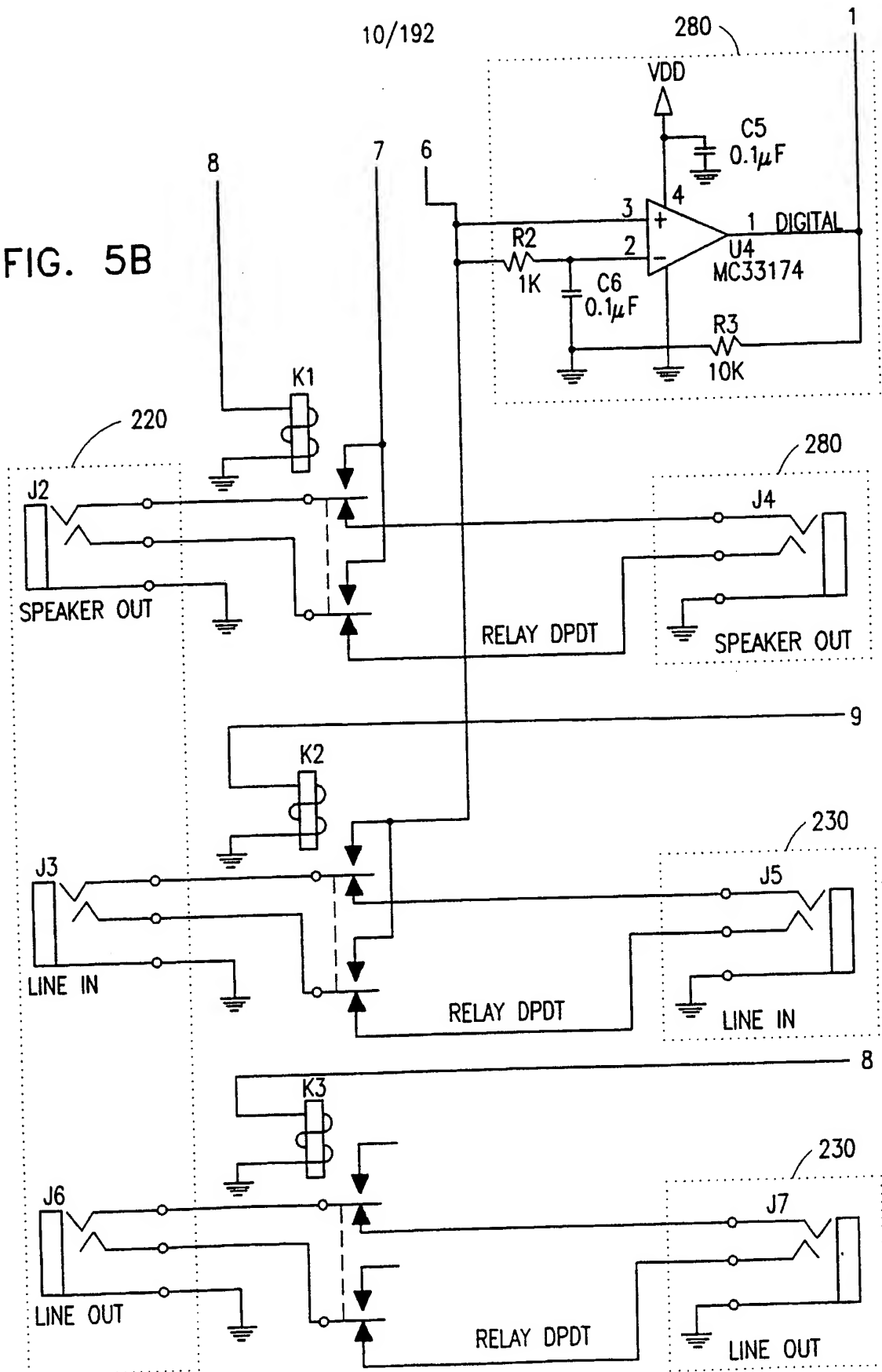


FIG. 5A



10/192

FIG. 5B



11/192

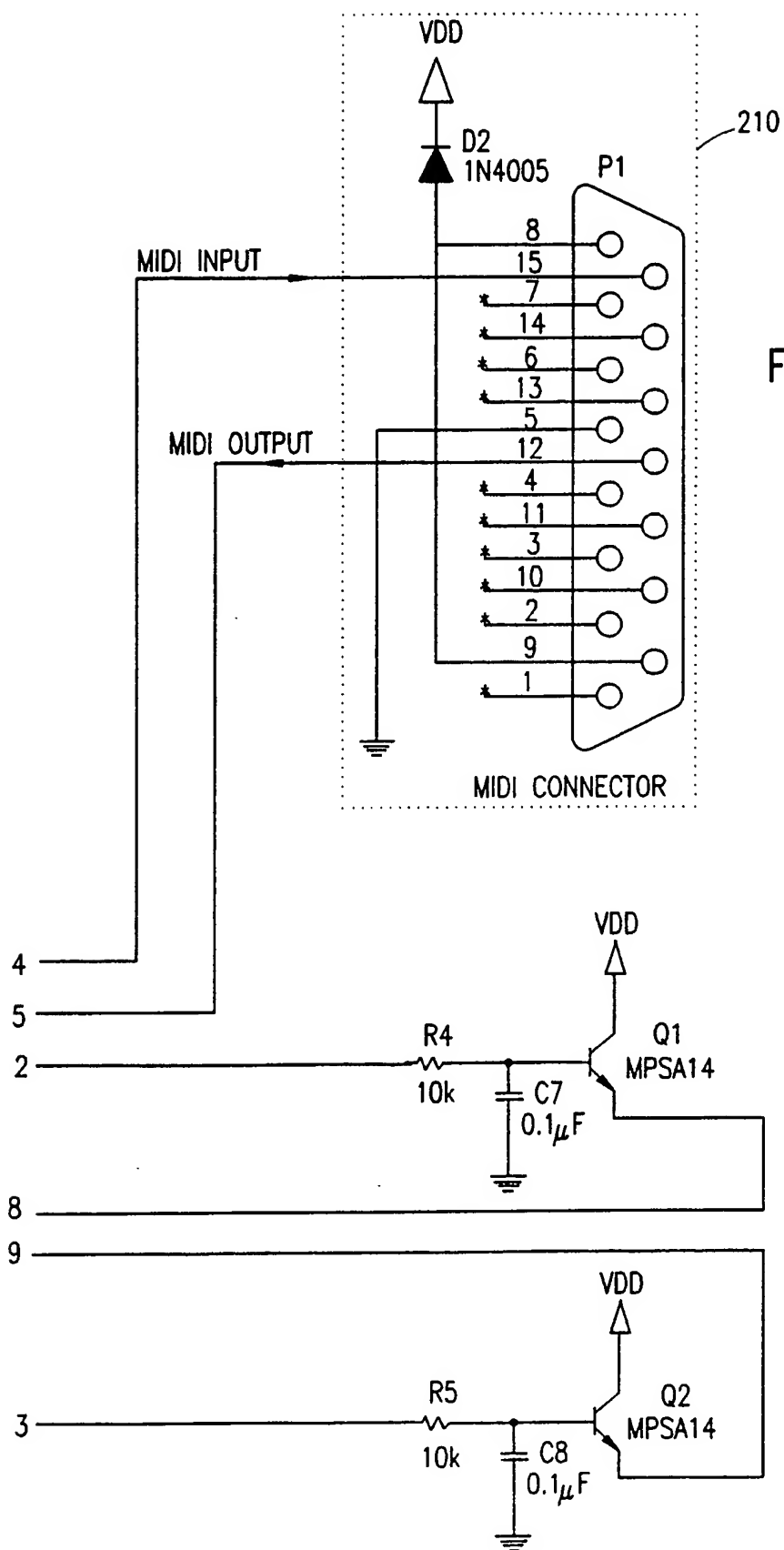


FIG. 5C

12/192

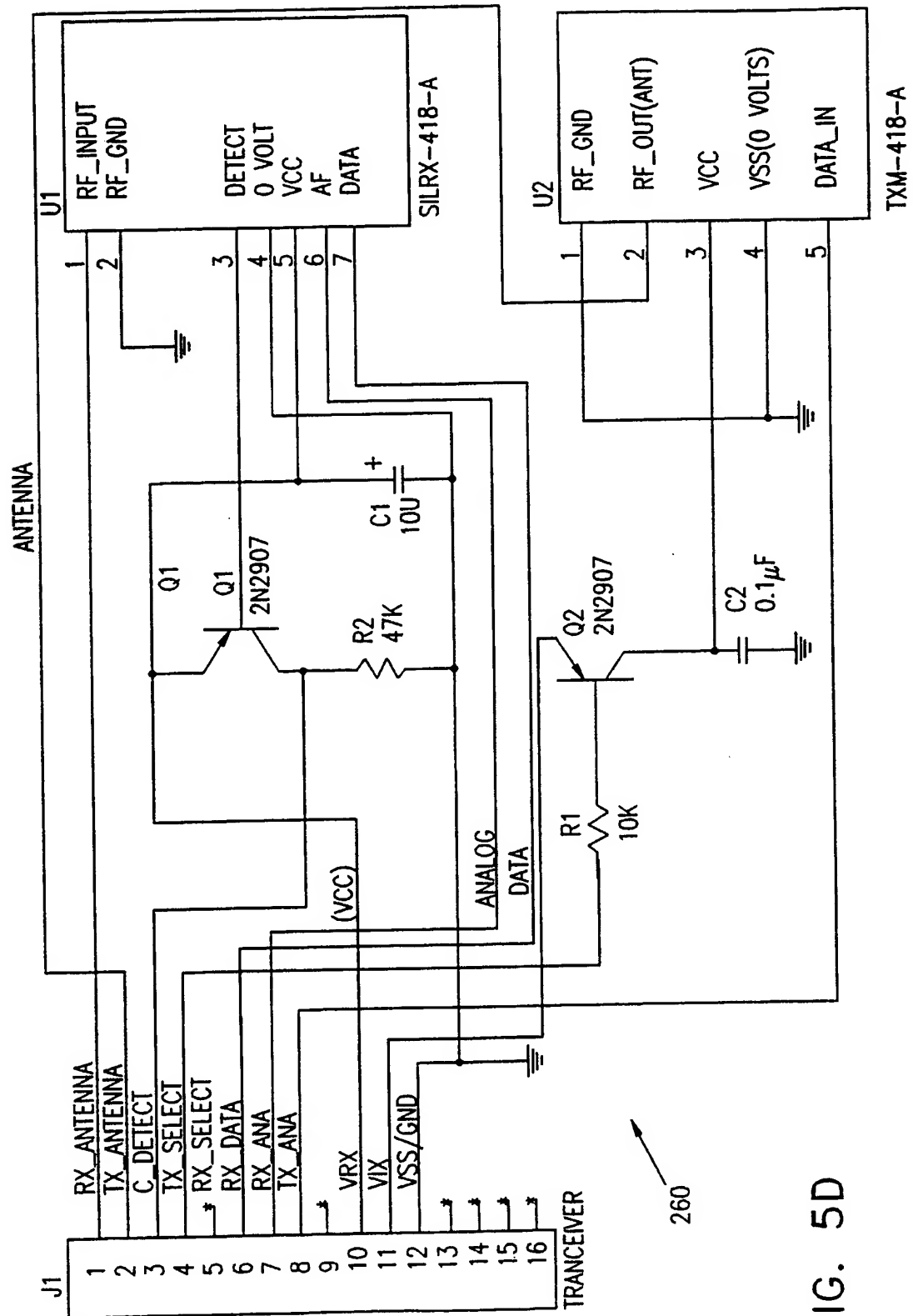


FIG. 5D

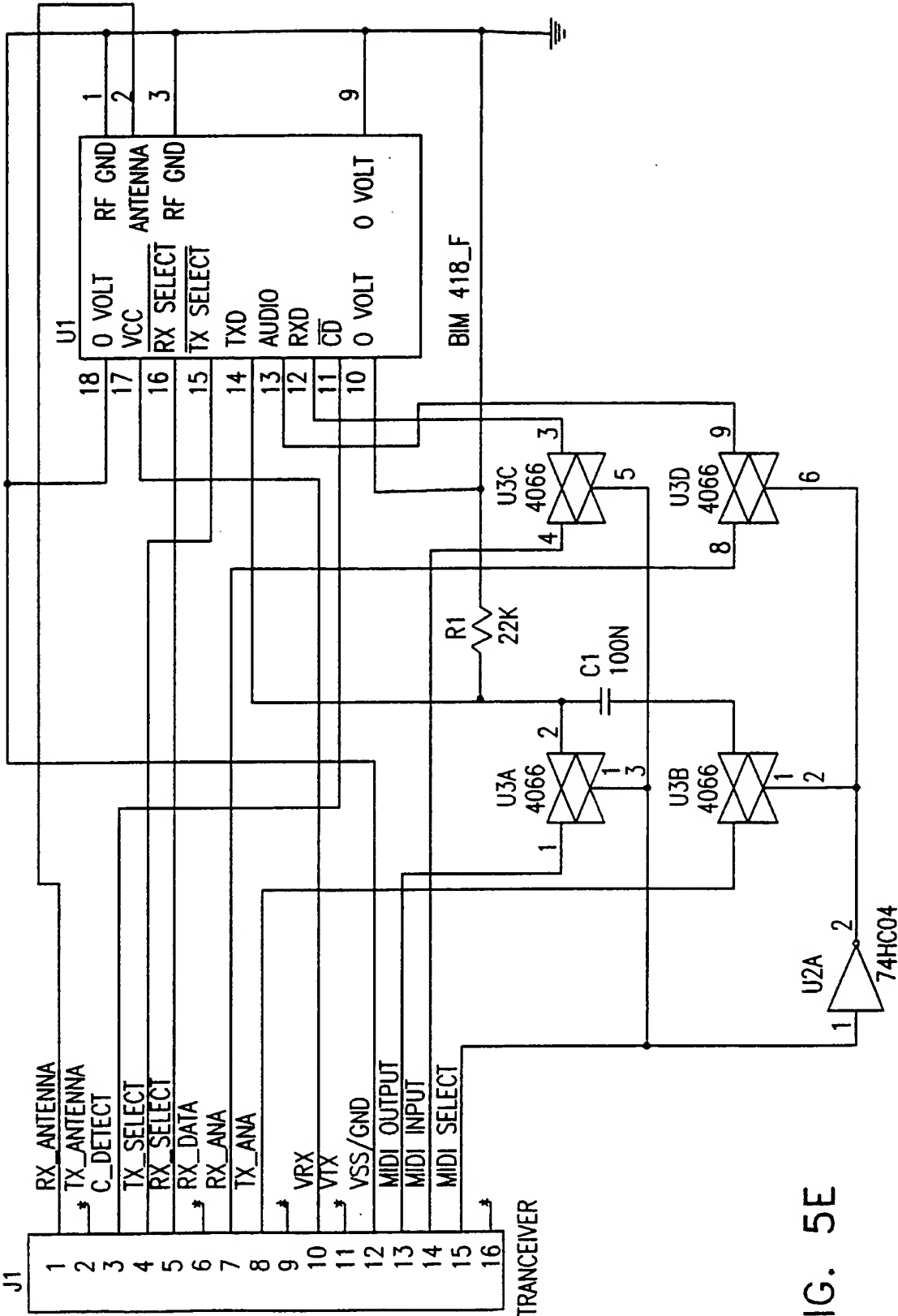
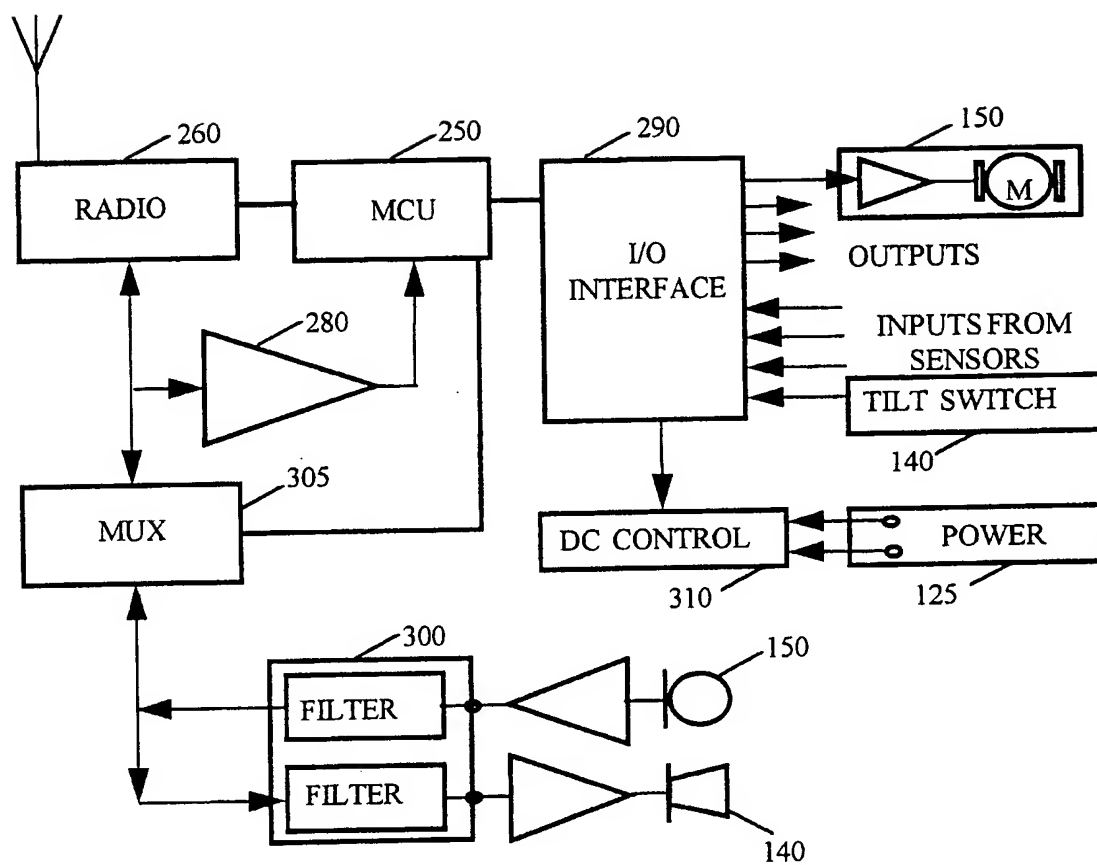


FIG. 5E

14/192

FIGURE 6





15/192

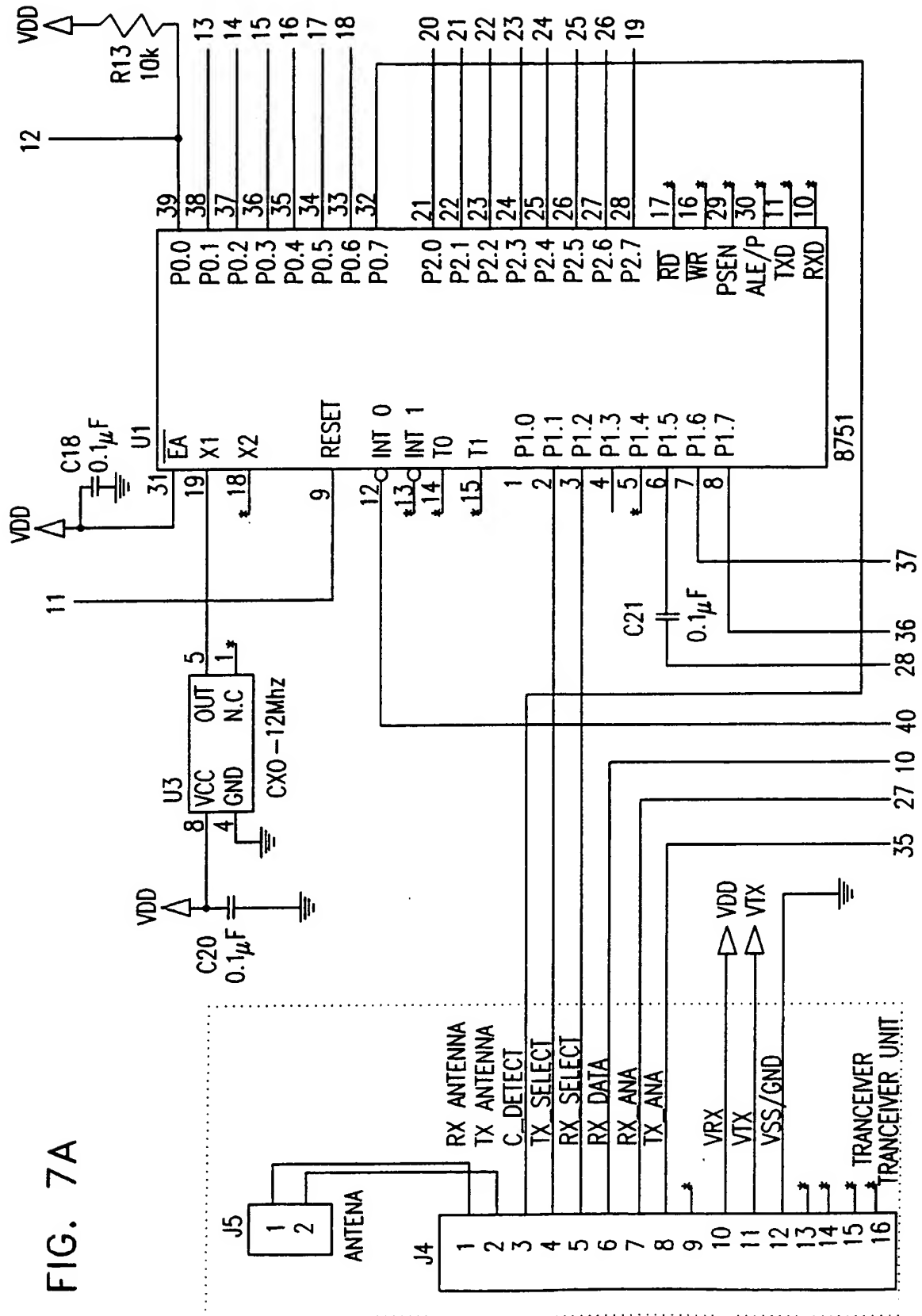
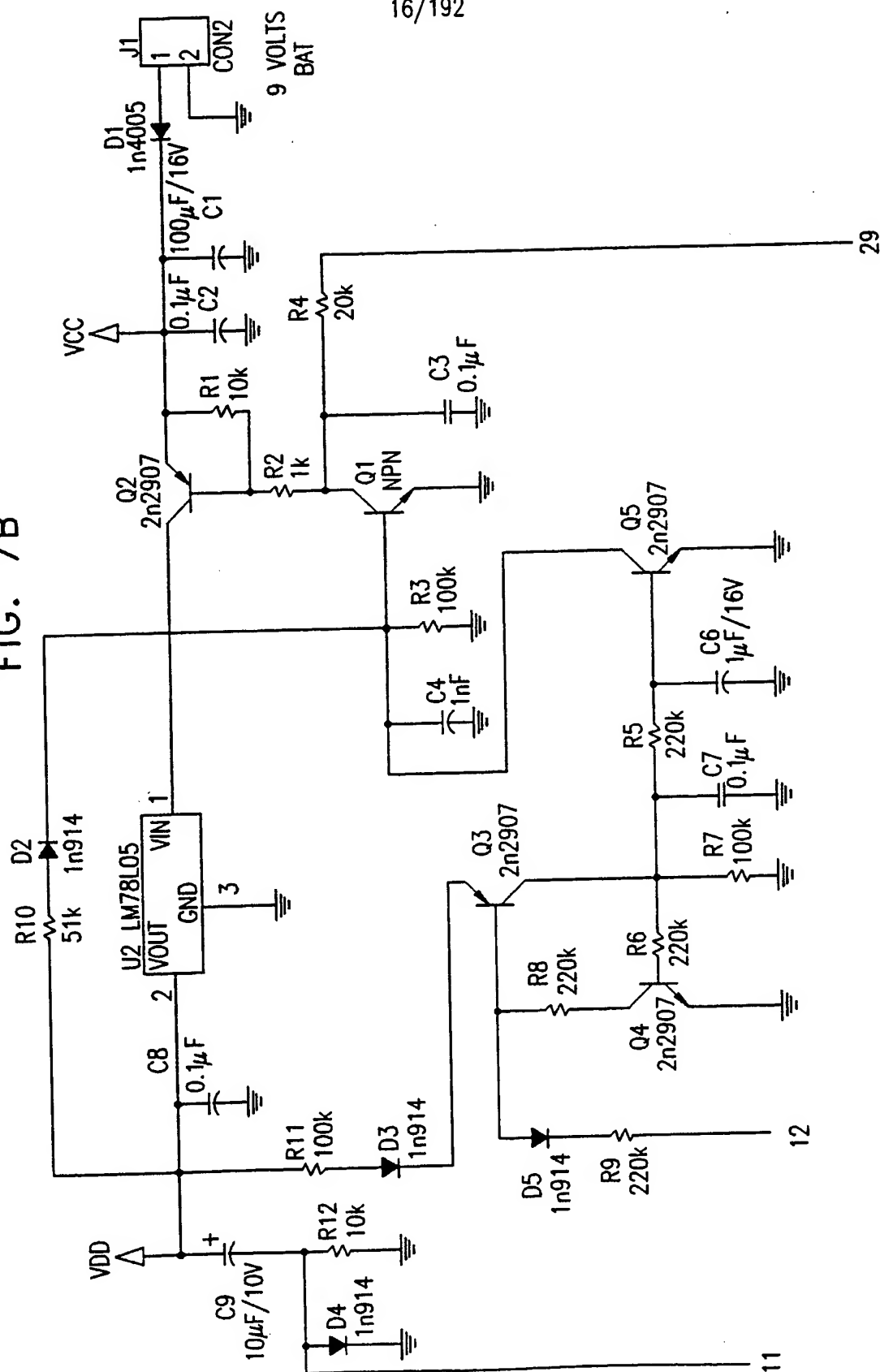
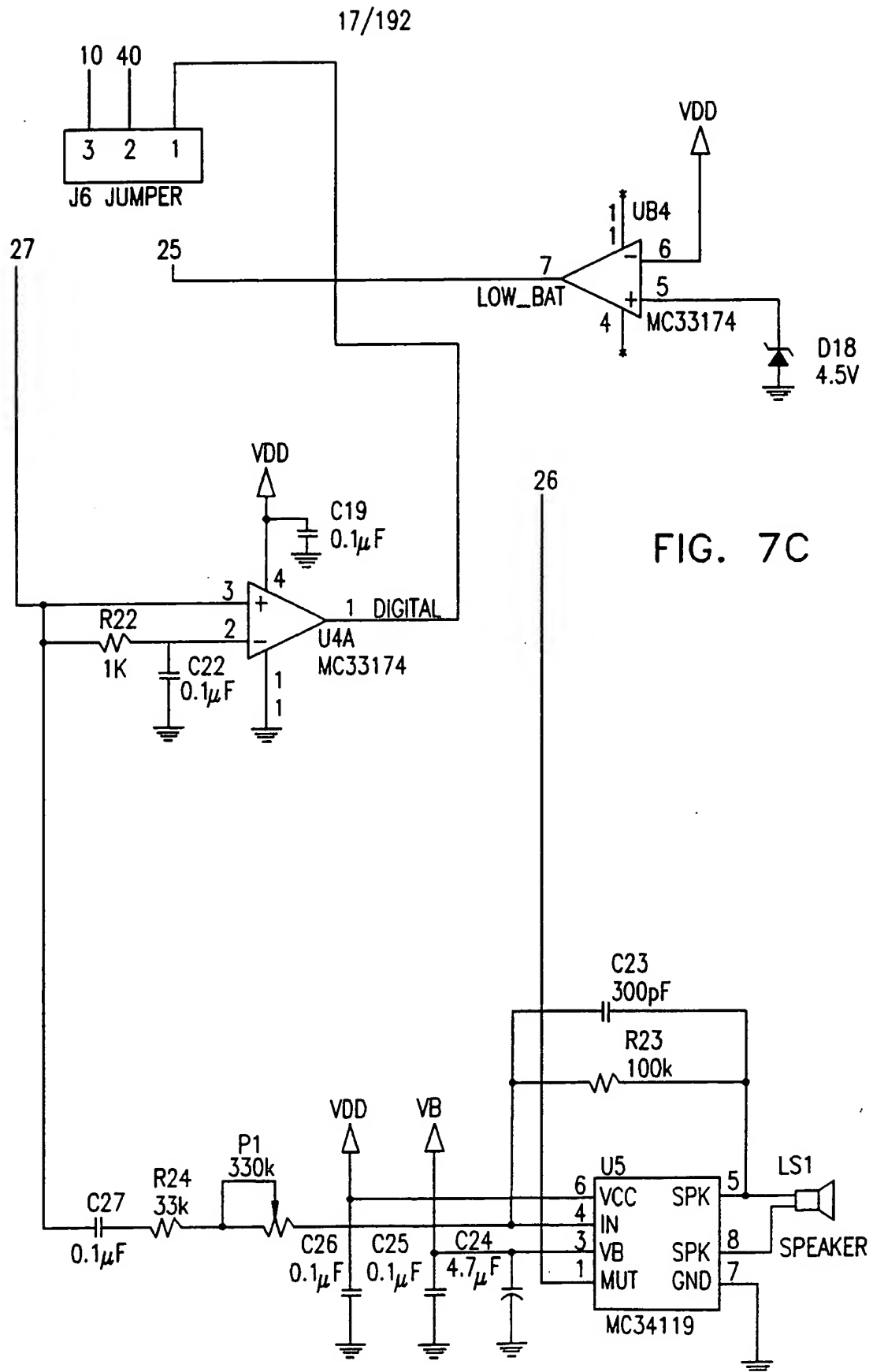


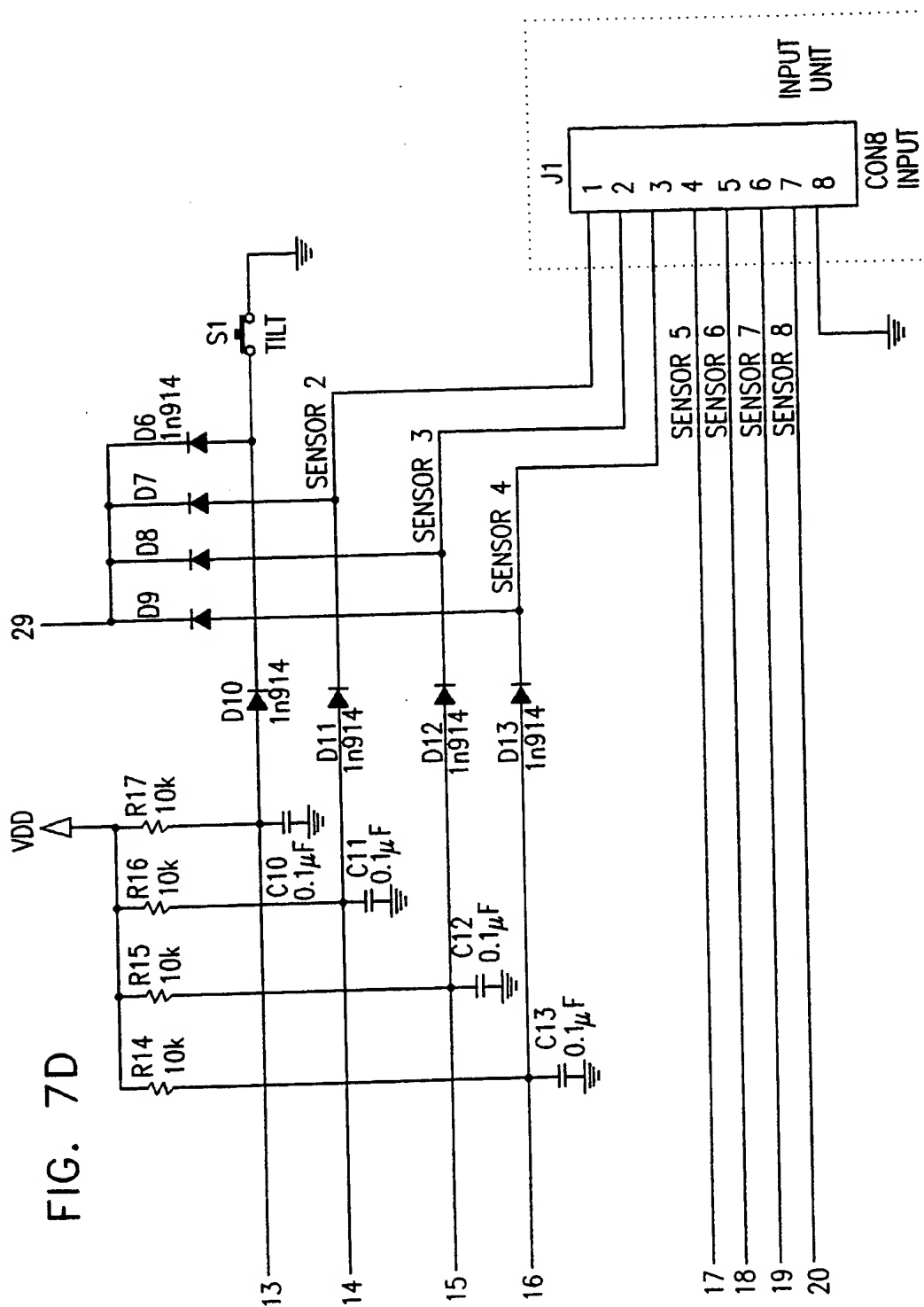
FIG. 7A

16/192

FIG. 7B

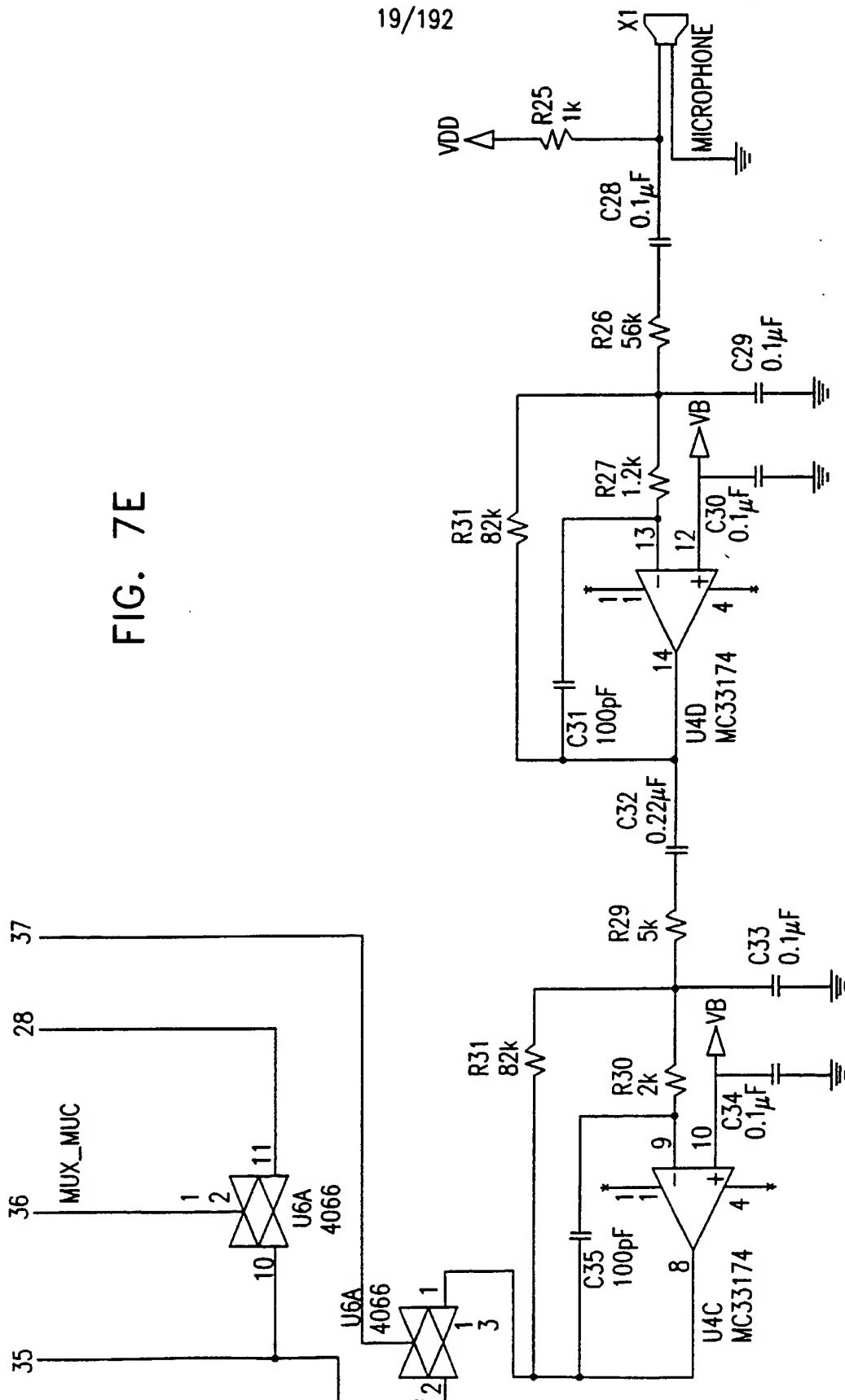






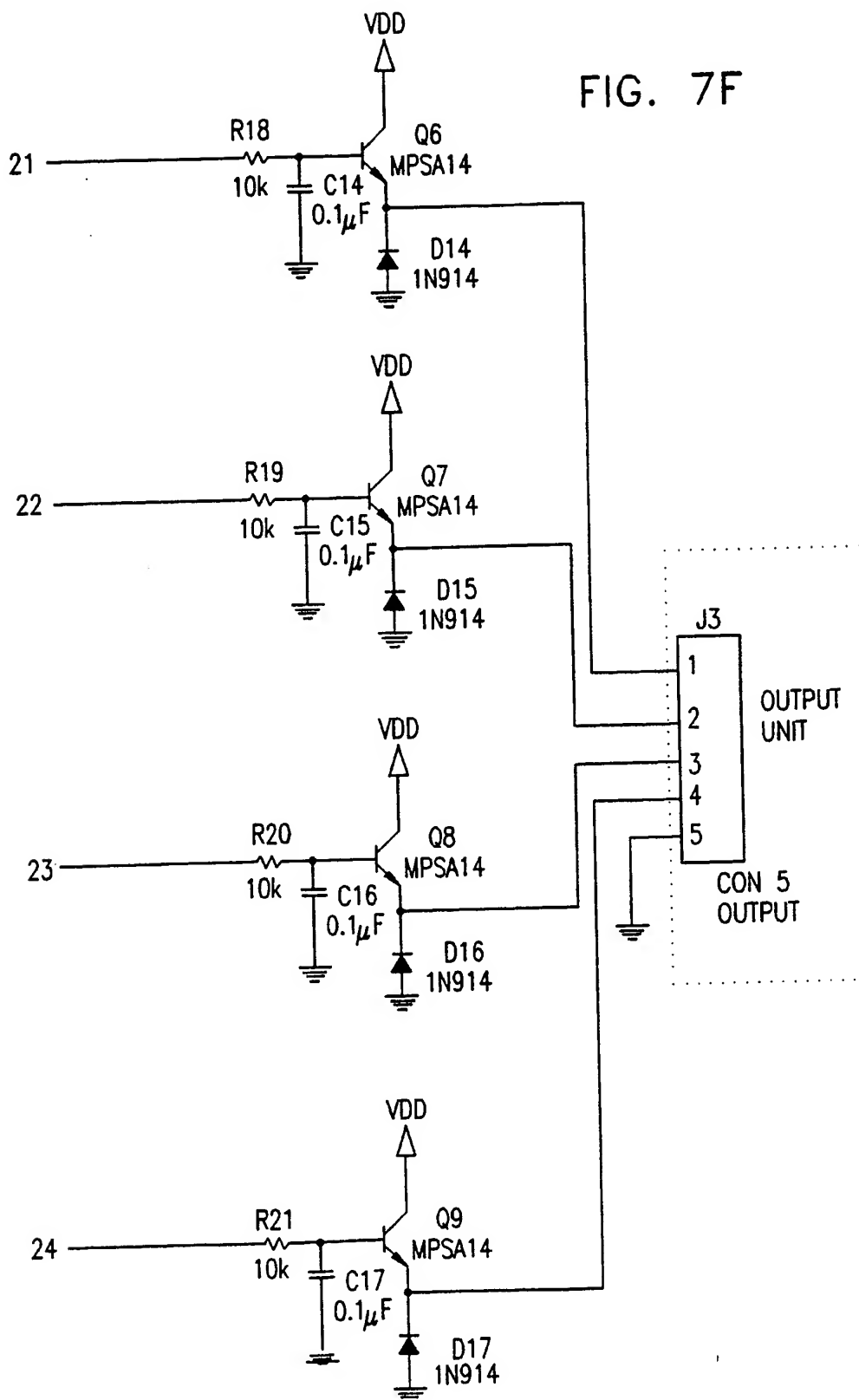
19/192

FIG. 7E



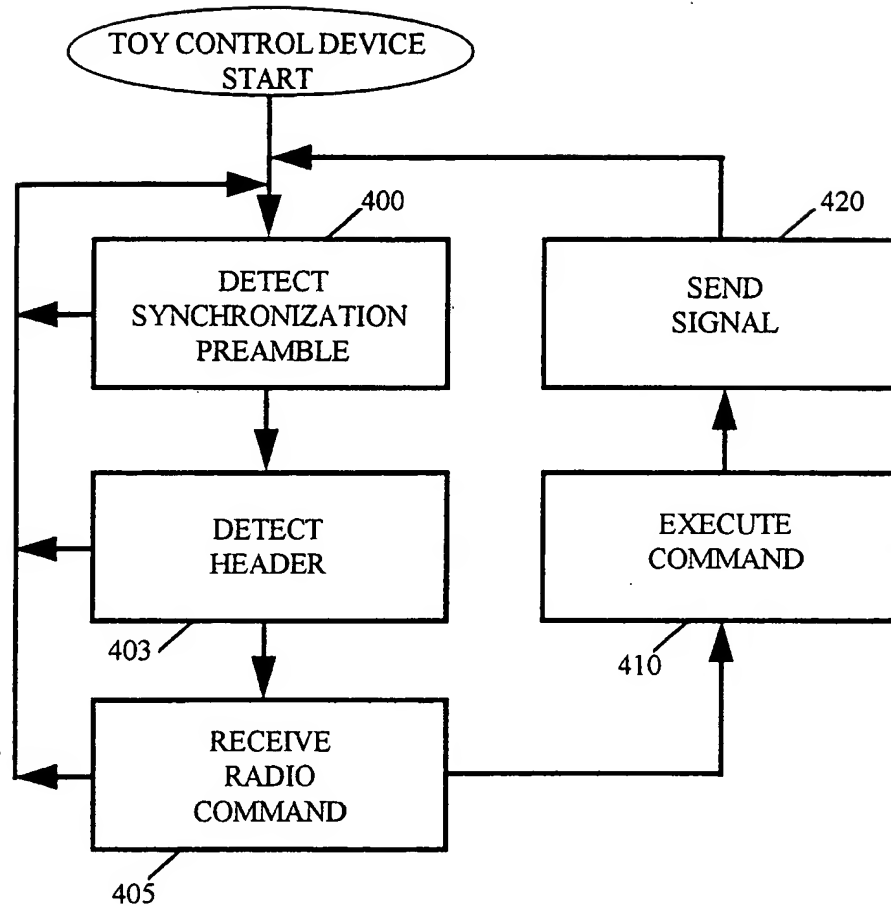
20/192

FIG. 7F



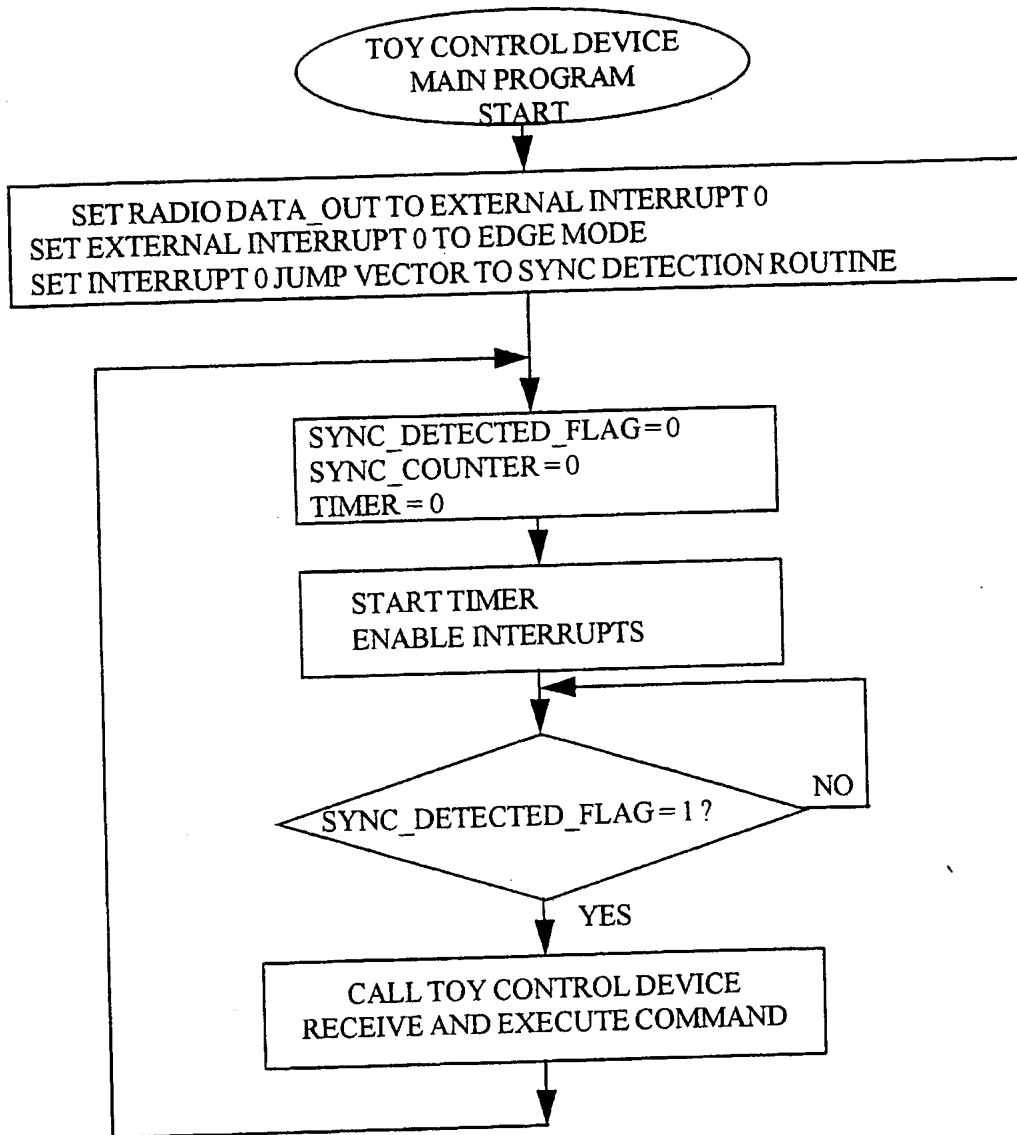
21/192

FIGURE 8A



22/192

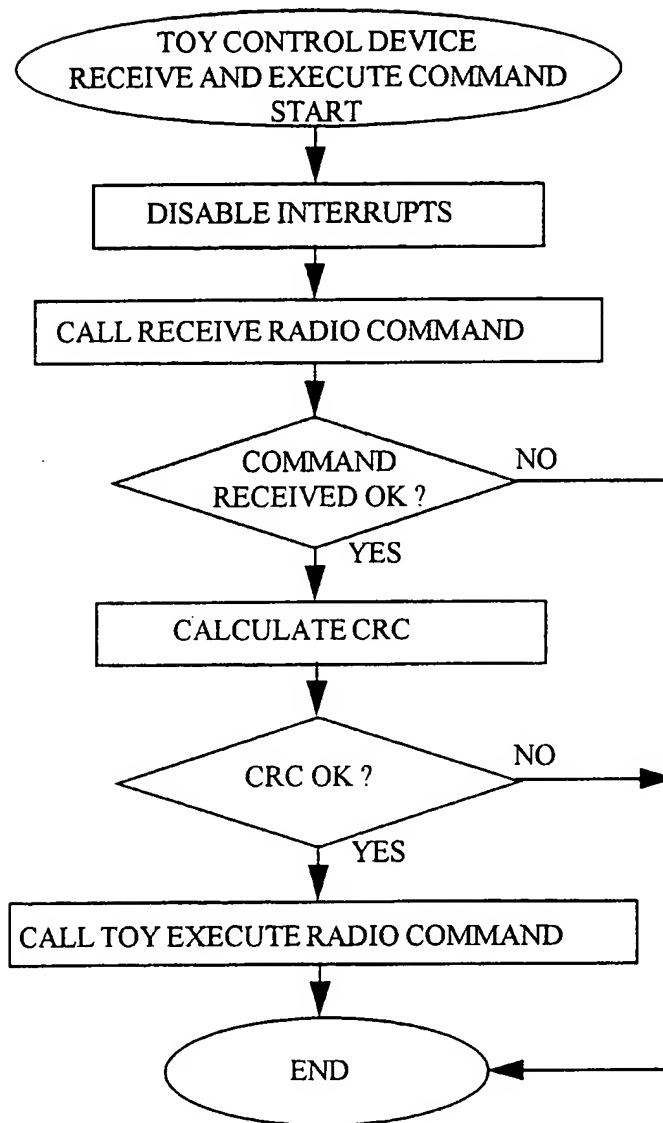
FIGURE 8B





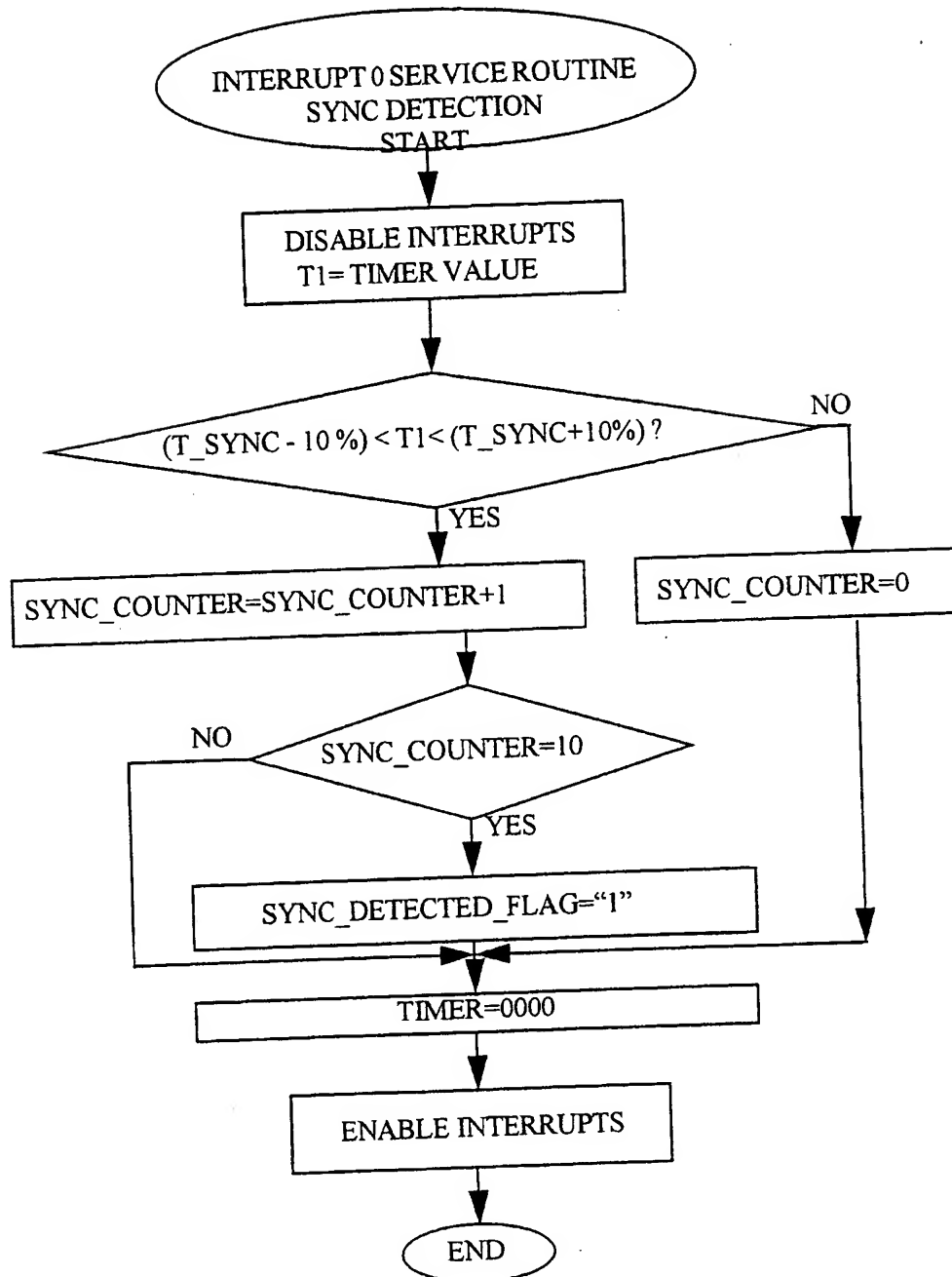
23/192

FIGURE 8C



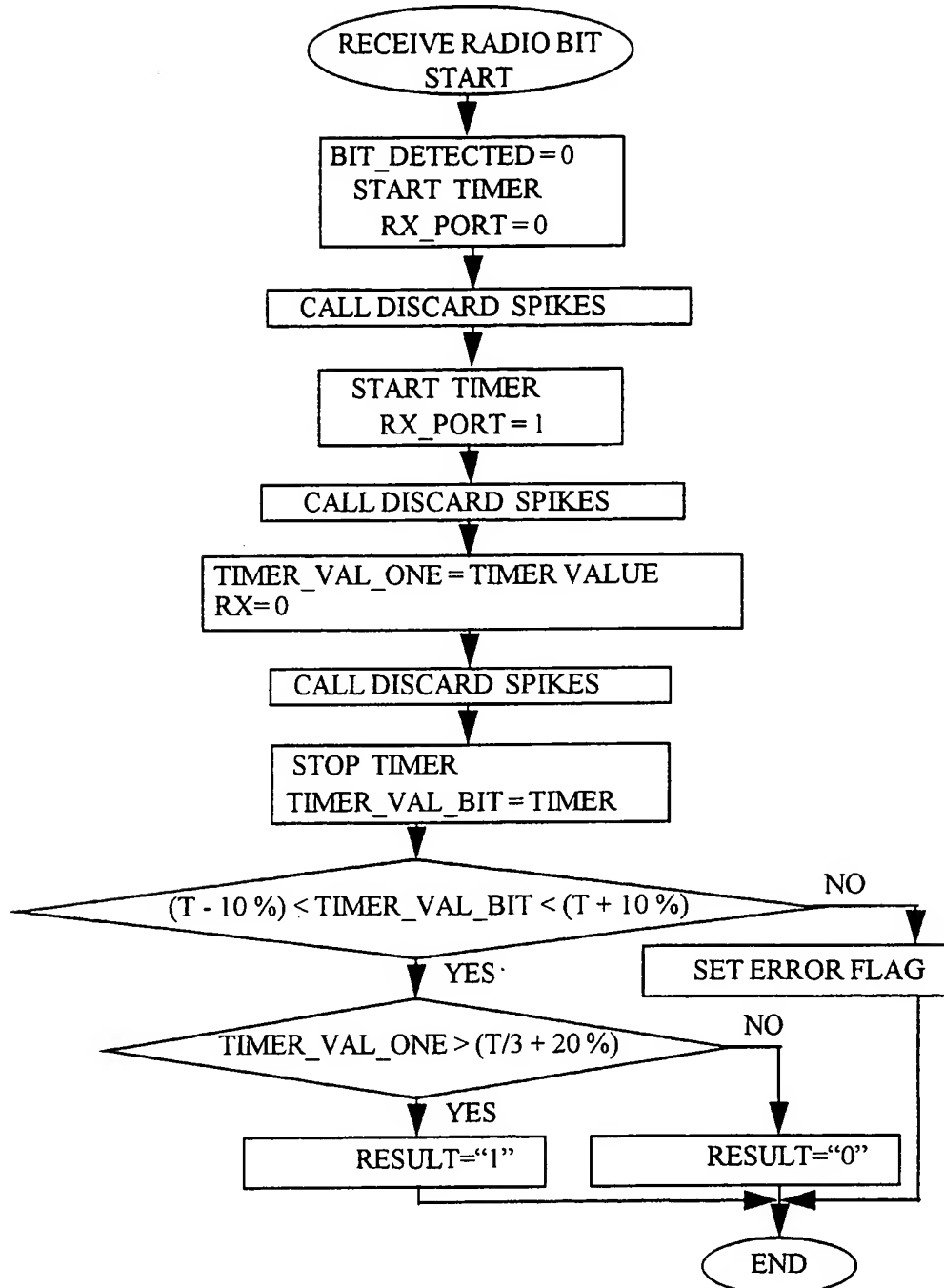
24/192

FIGURE 8D



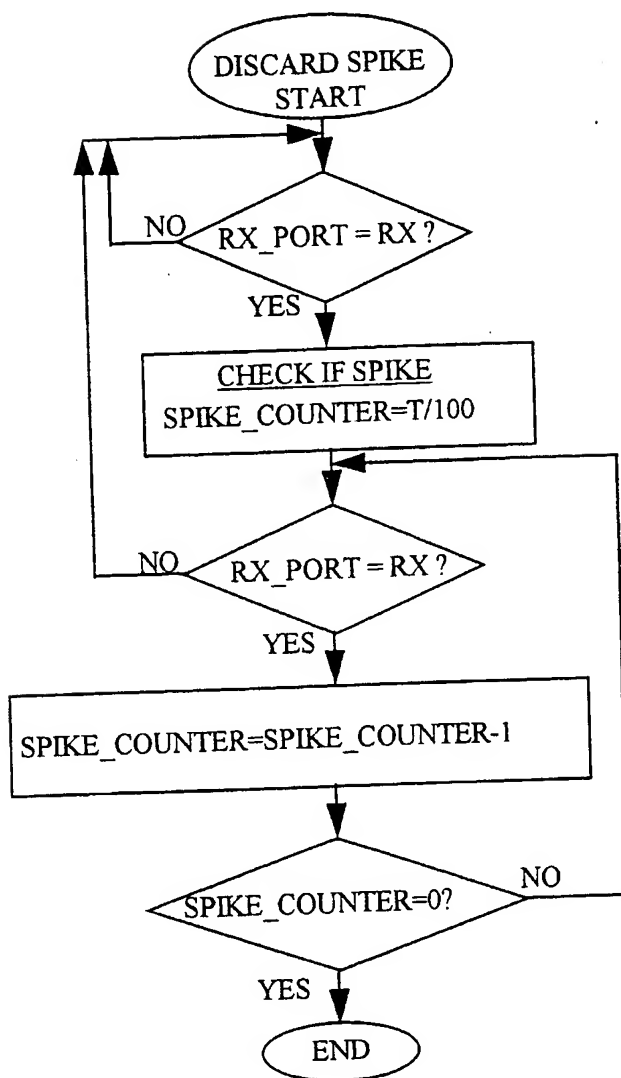
25/192

FIGURE 8E



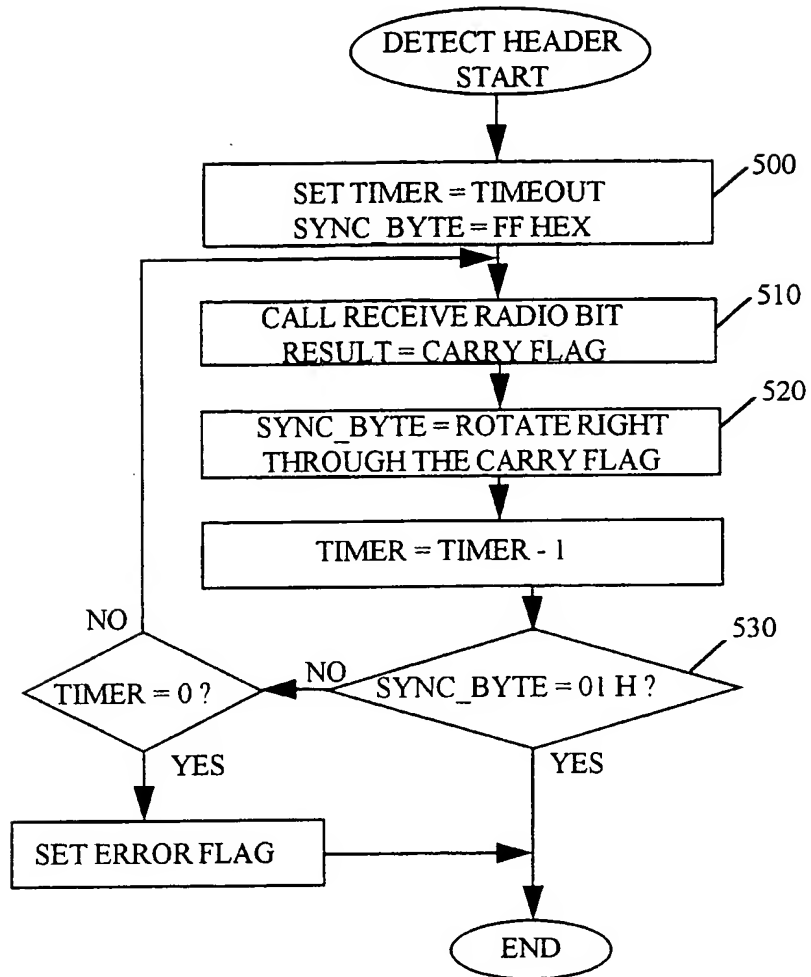
26/192

FIGURE 8F



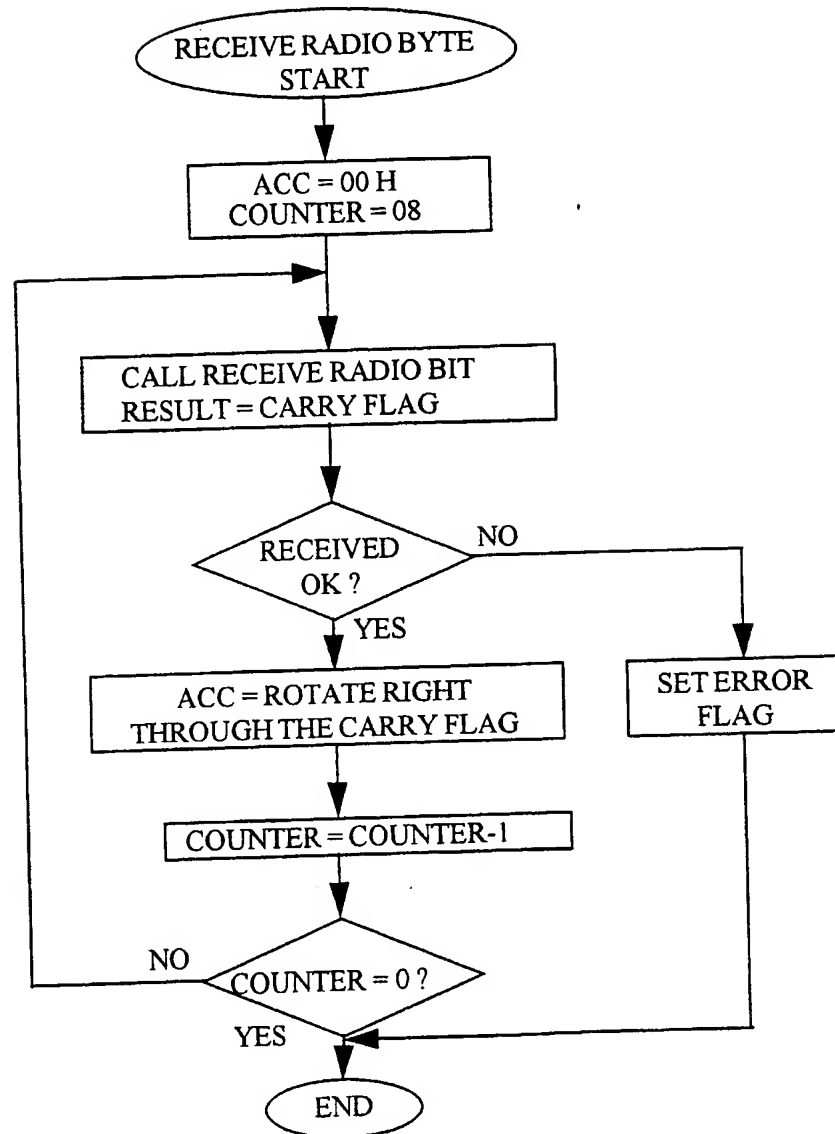
27/192

FIGURE 8G



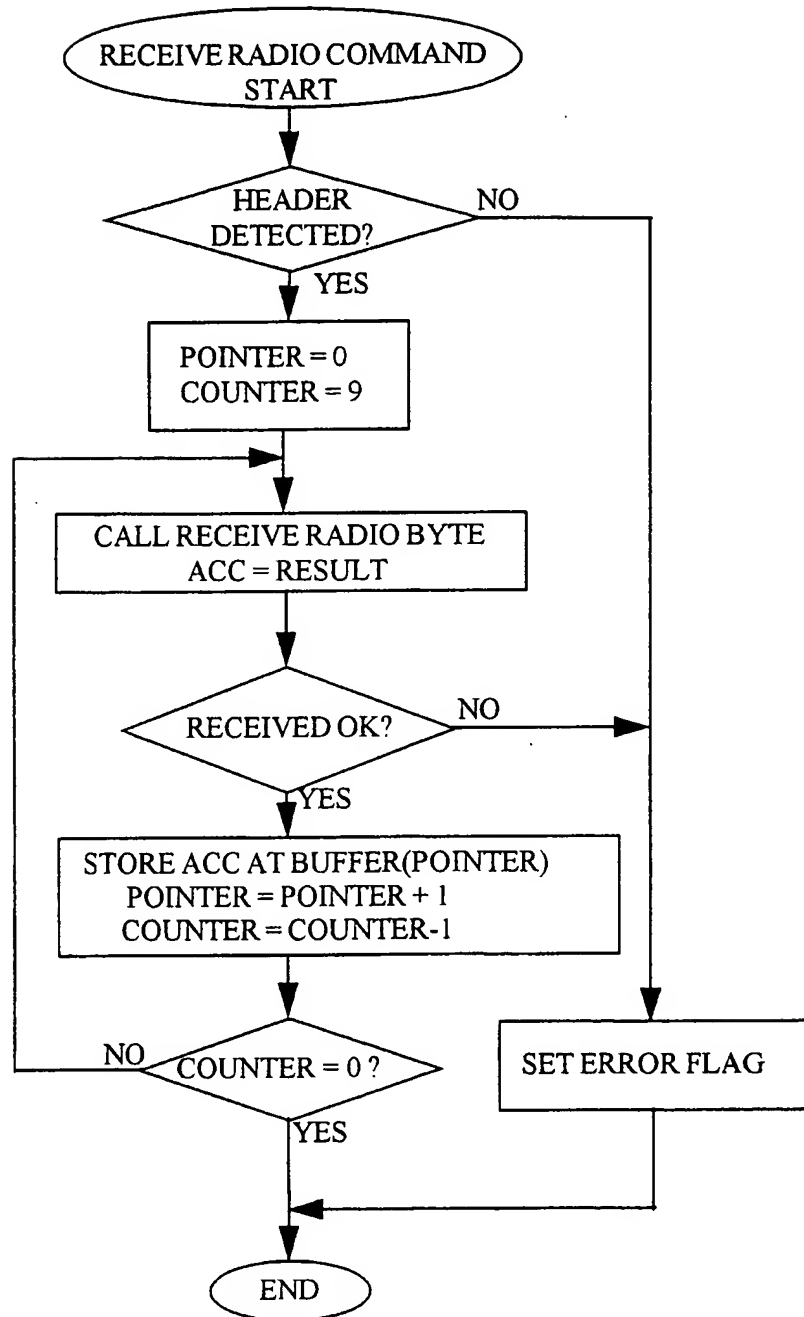
28/192

FIGURE 8H



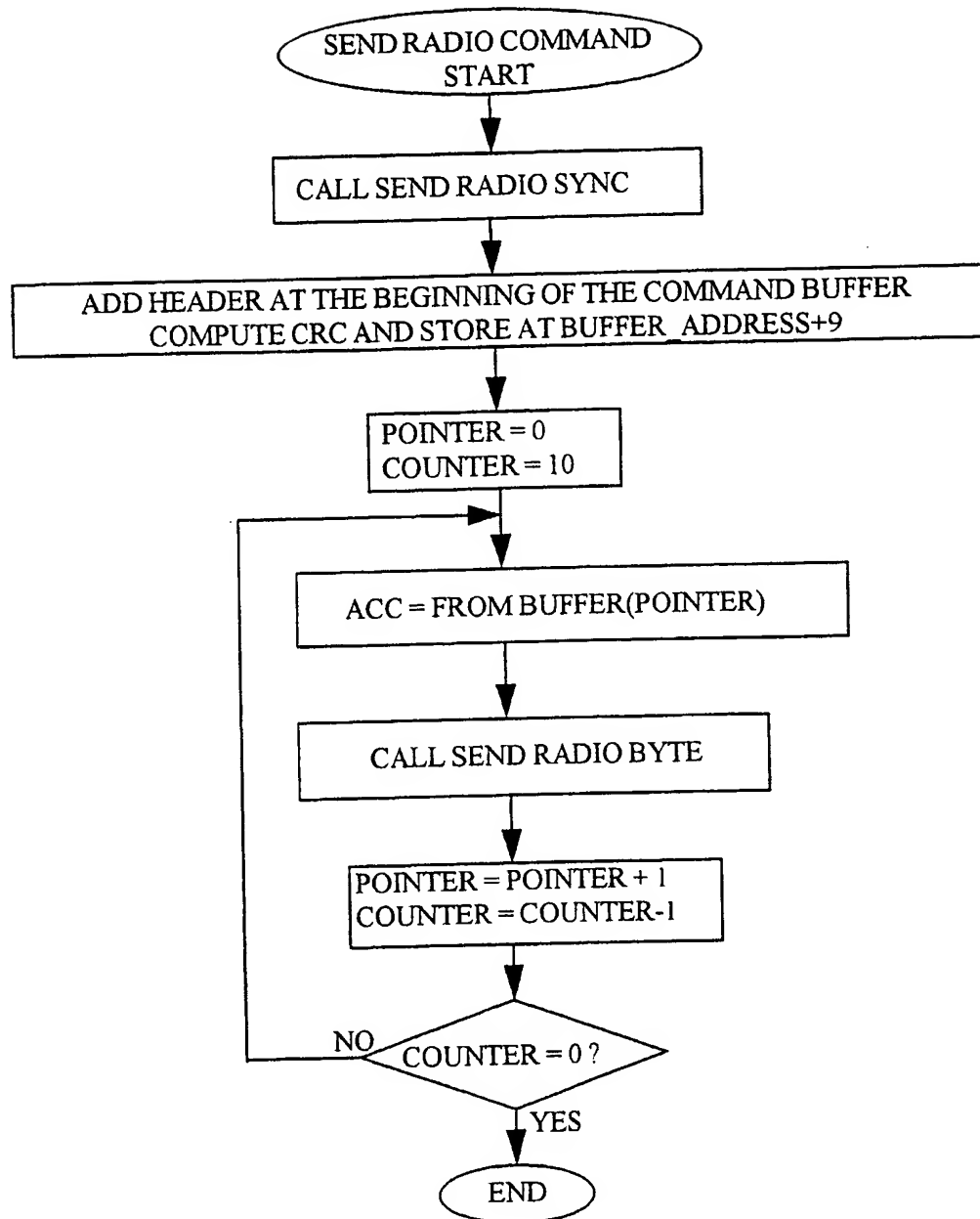
29/192

FIGURE 8I



30/192

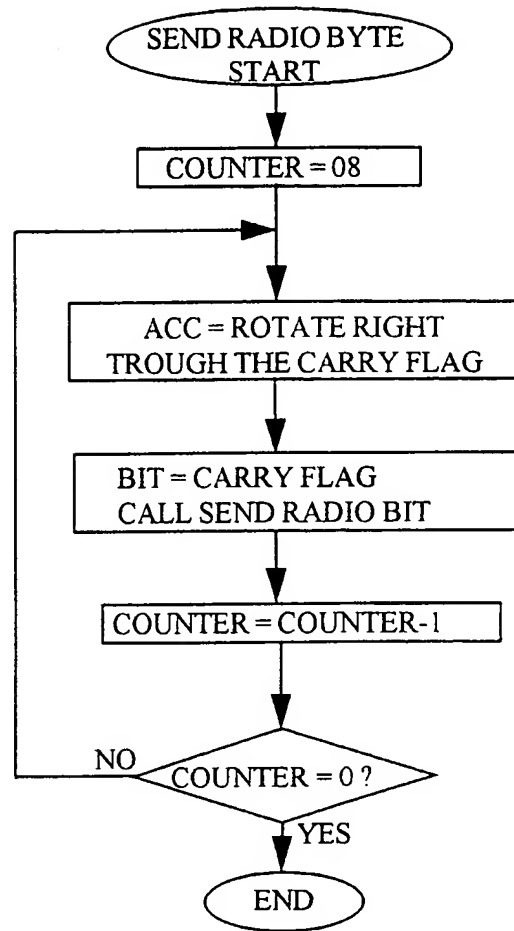
FIGURE 8J





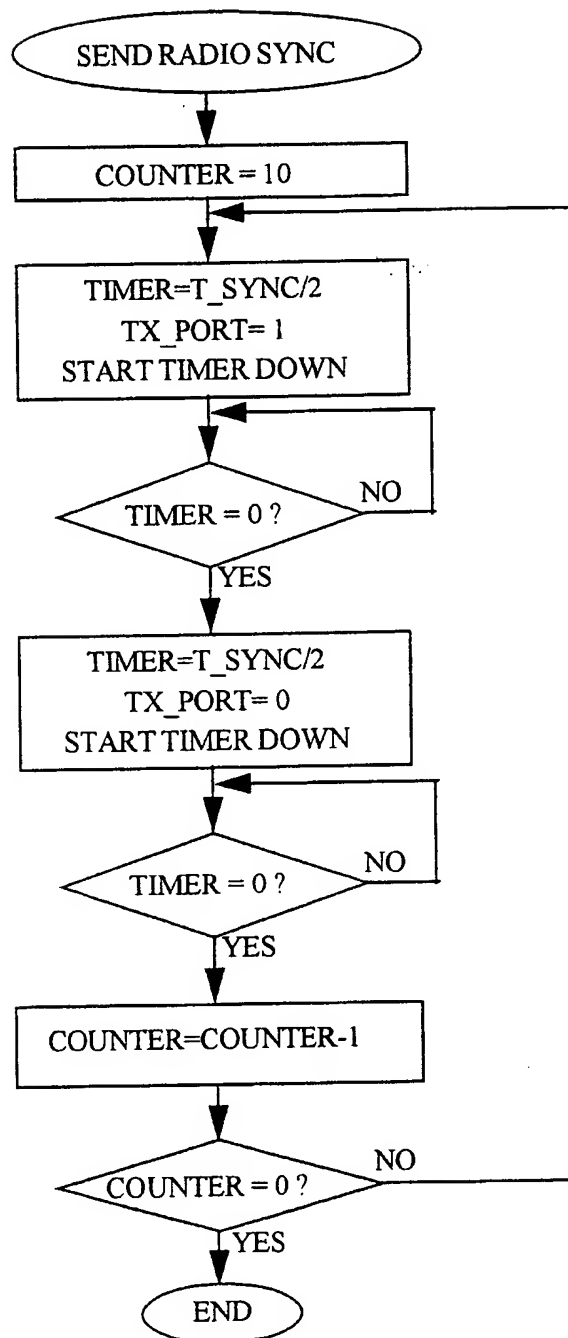
31/192

FIGURE 8K



32/192

FIGURE 8L



33/192

FIGURE 8M

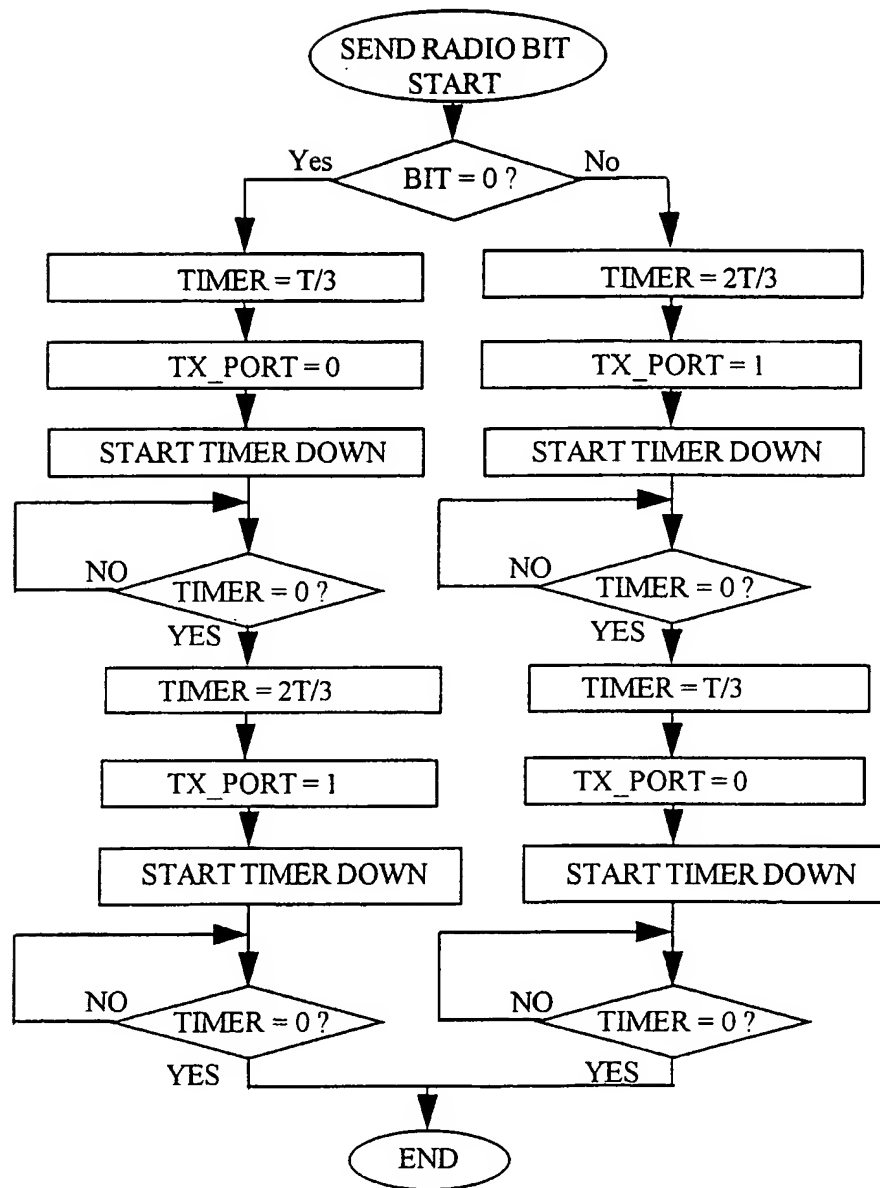


FIGURE 8N

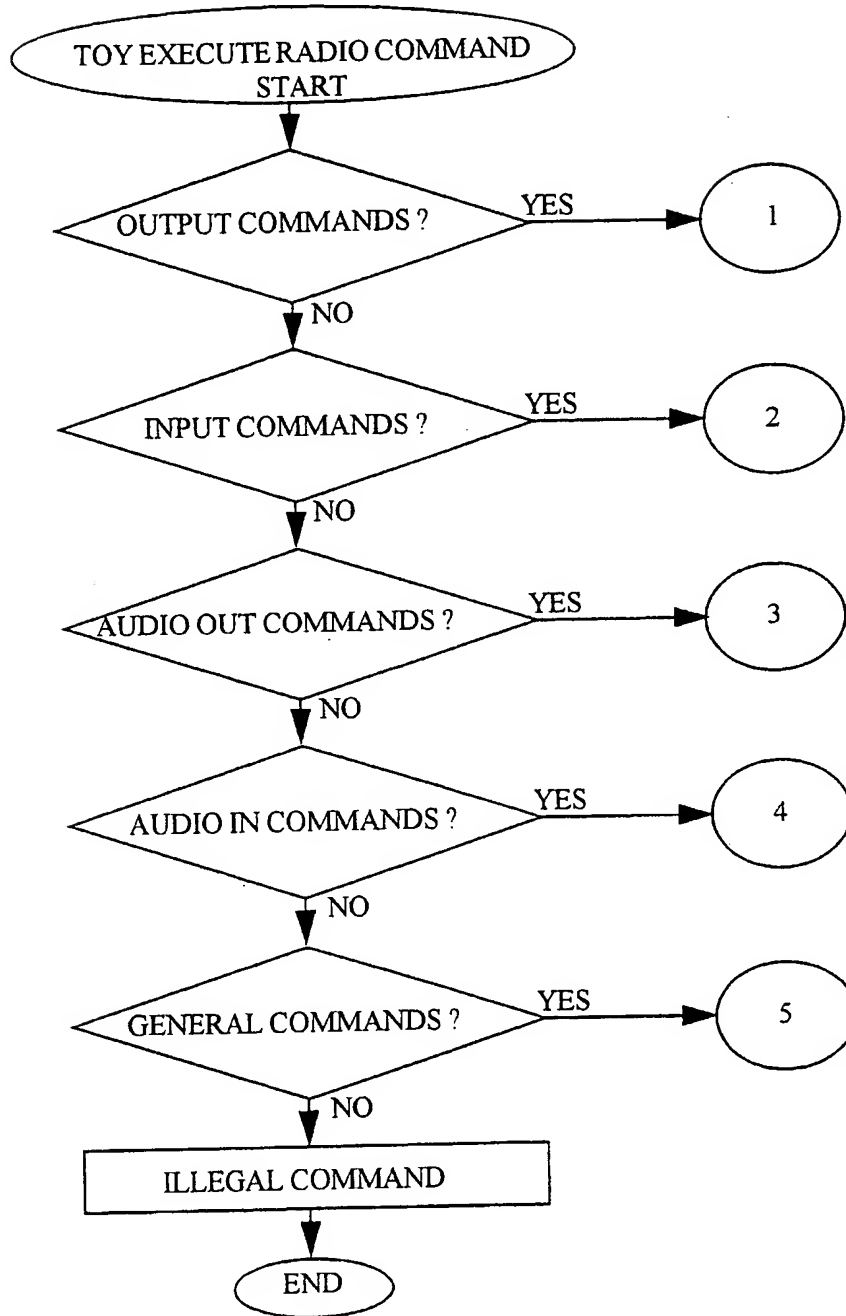


FIGURE 80

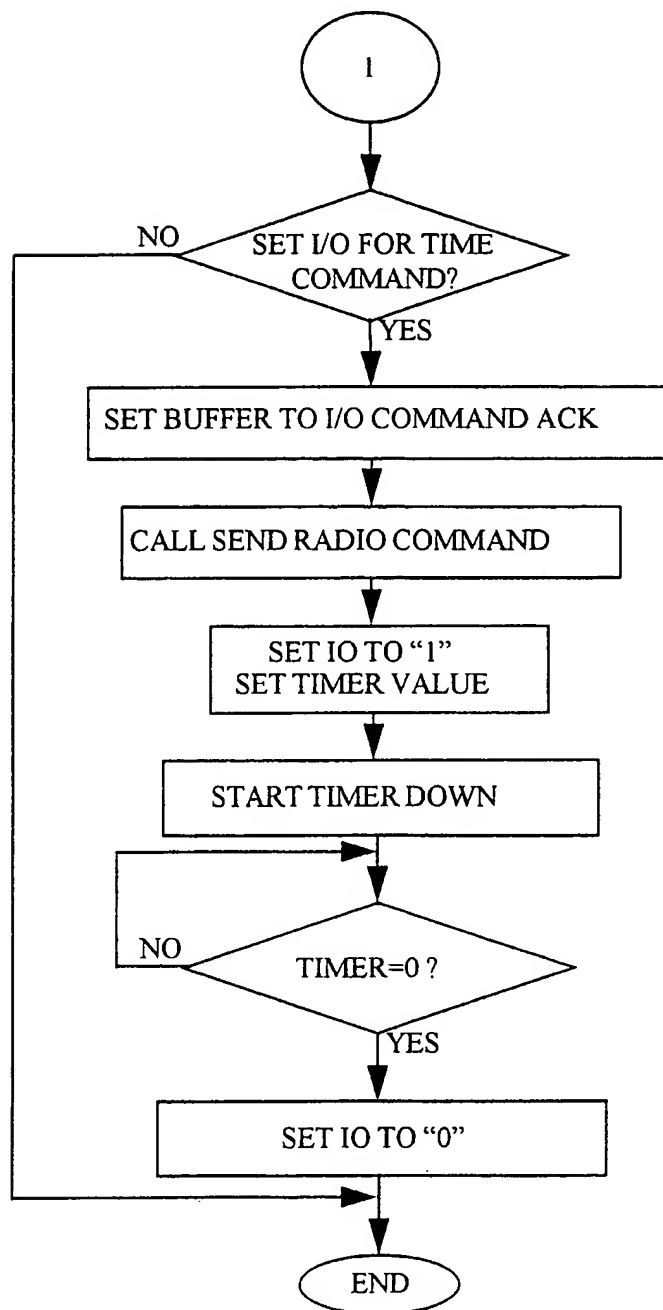
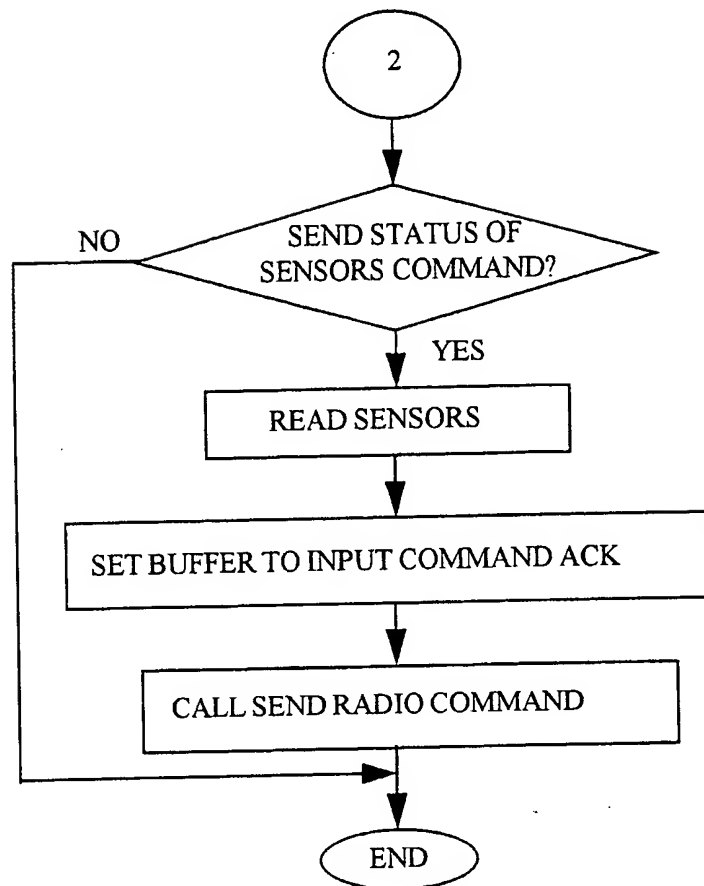
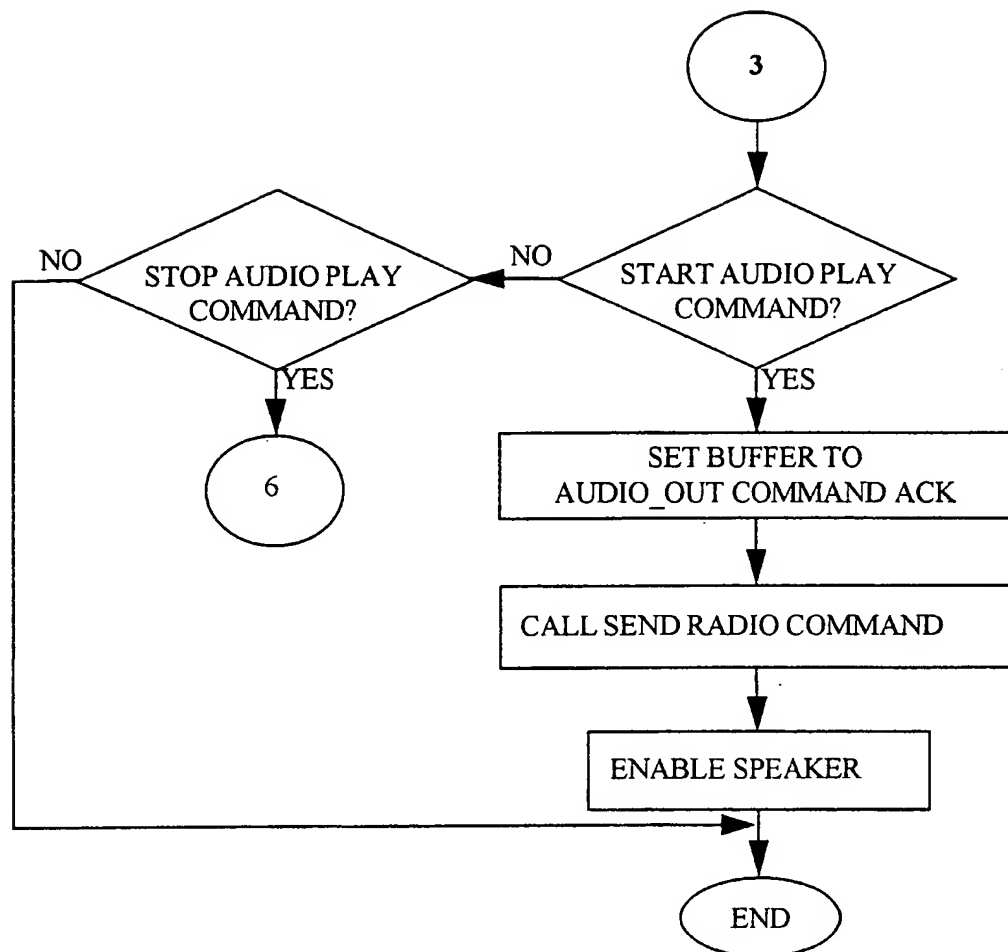


FIGURE 8P



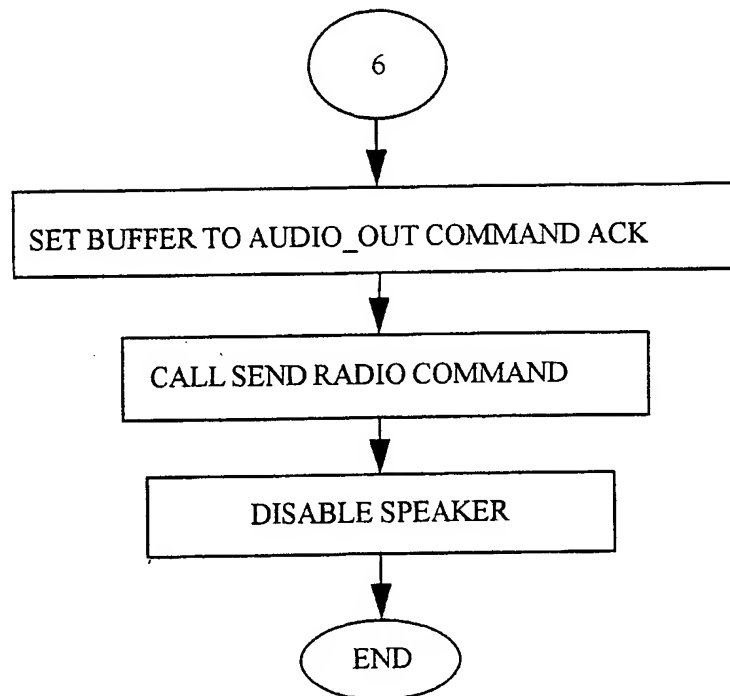
37/192

FIGURE 8Q



38/192

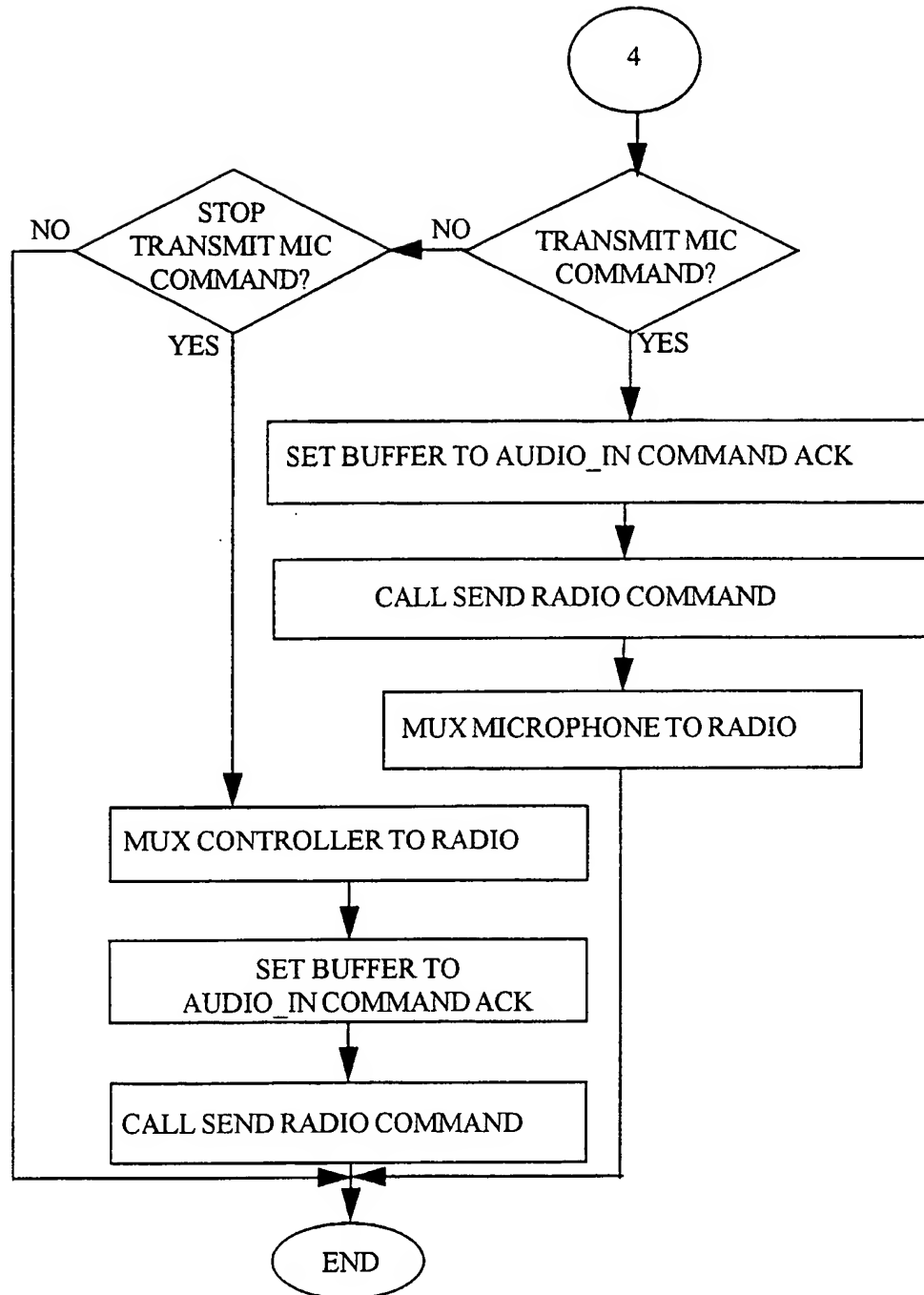
FIGURE 8R





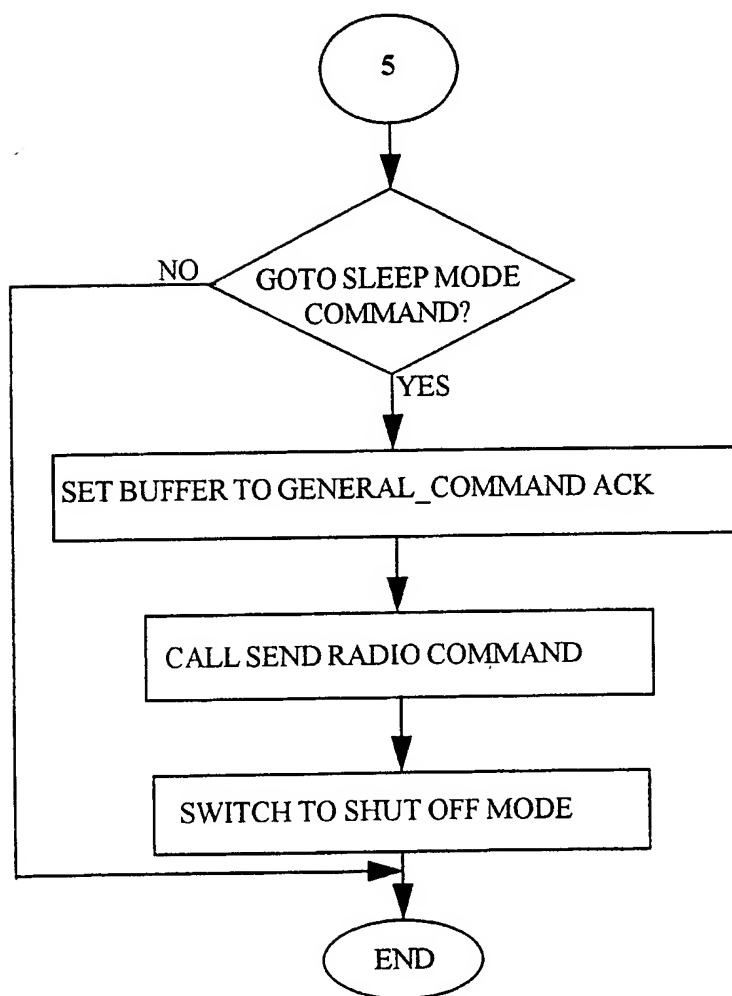
39/192

FIGURE 8S



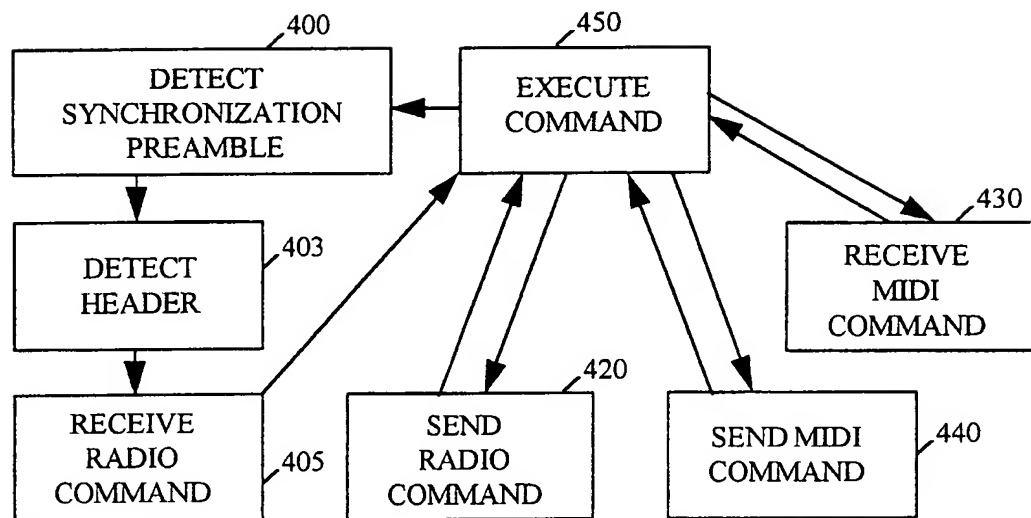
40/192

FIGURE 8T



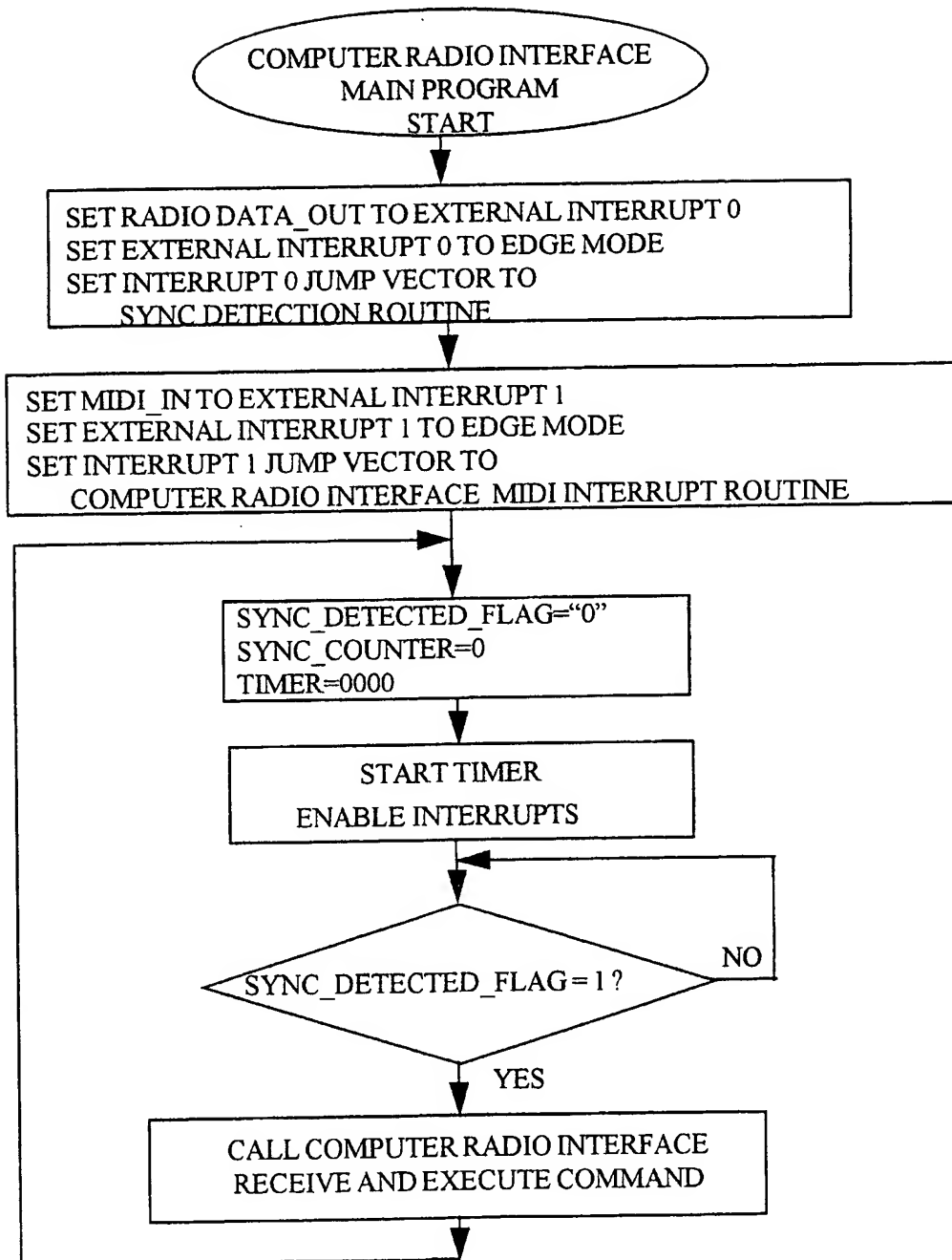
41/192

FIGURE 9A



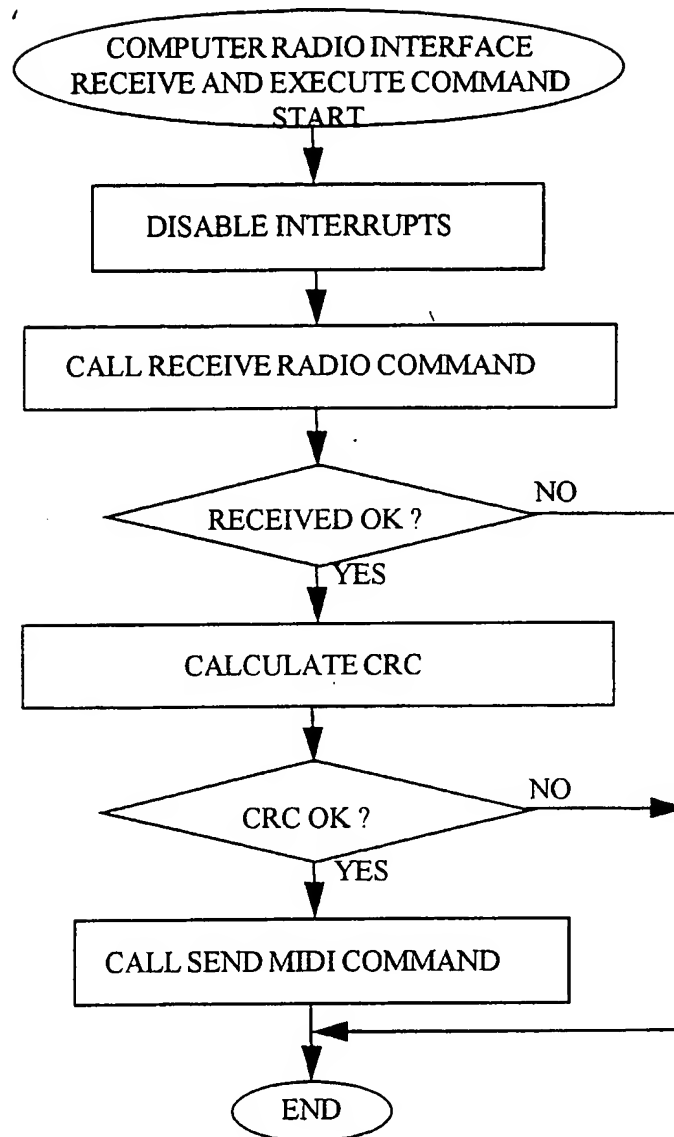
42/192

FIGURE 9B



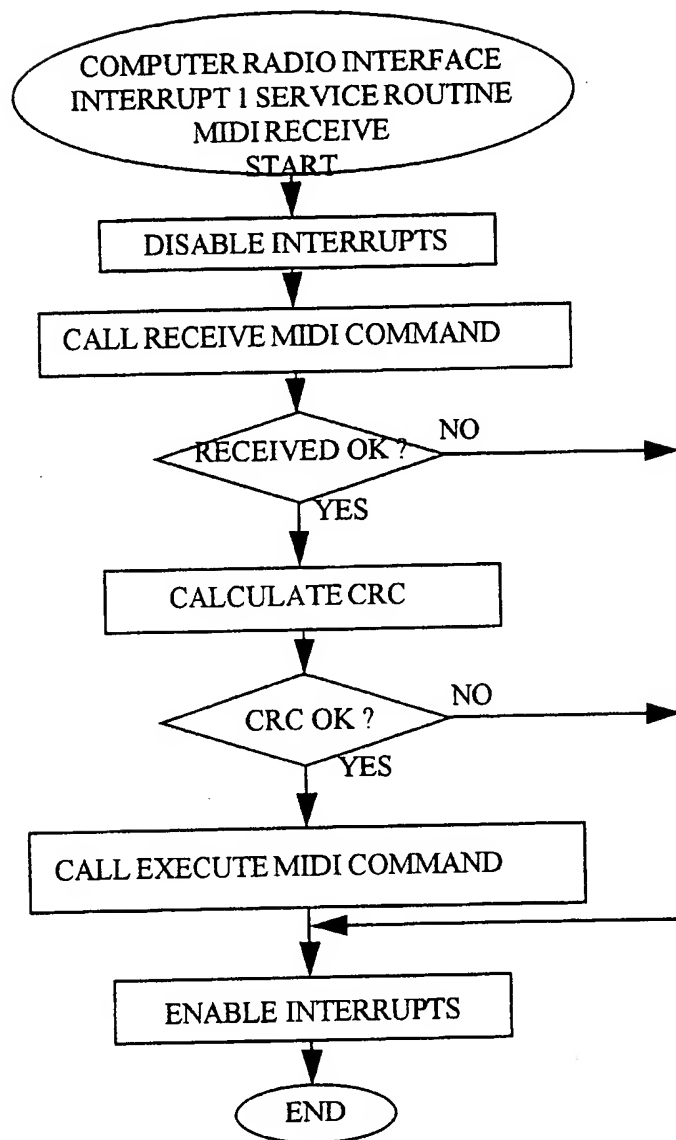
43/192

FIGURE 9C



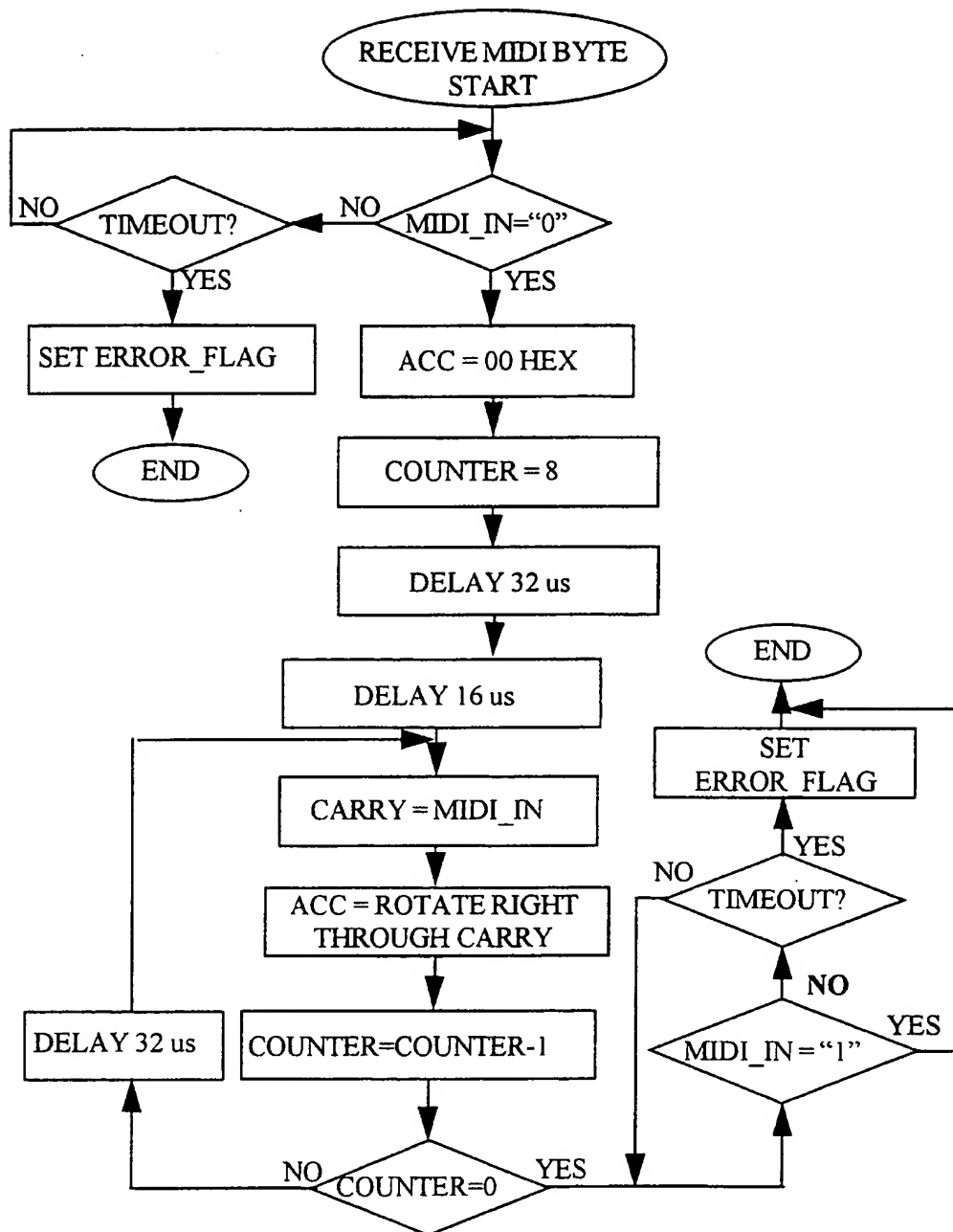
44/192

FIGURE 9D



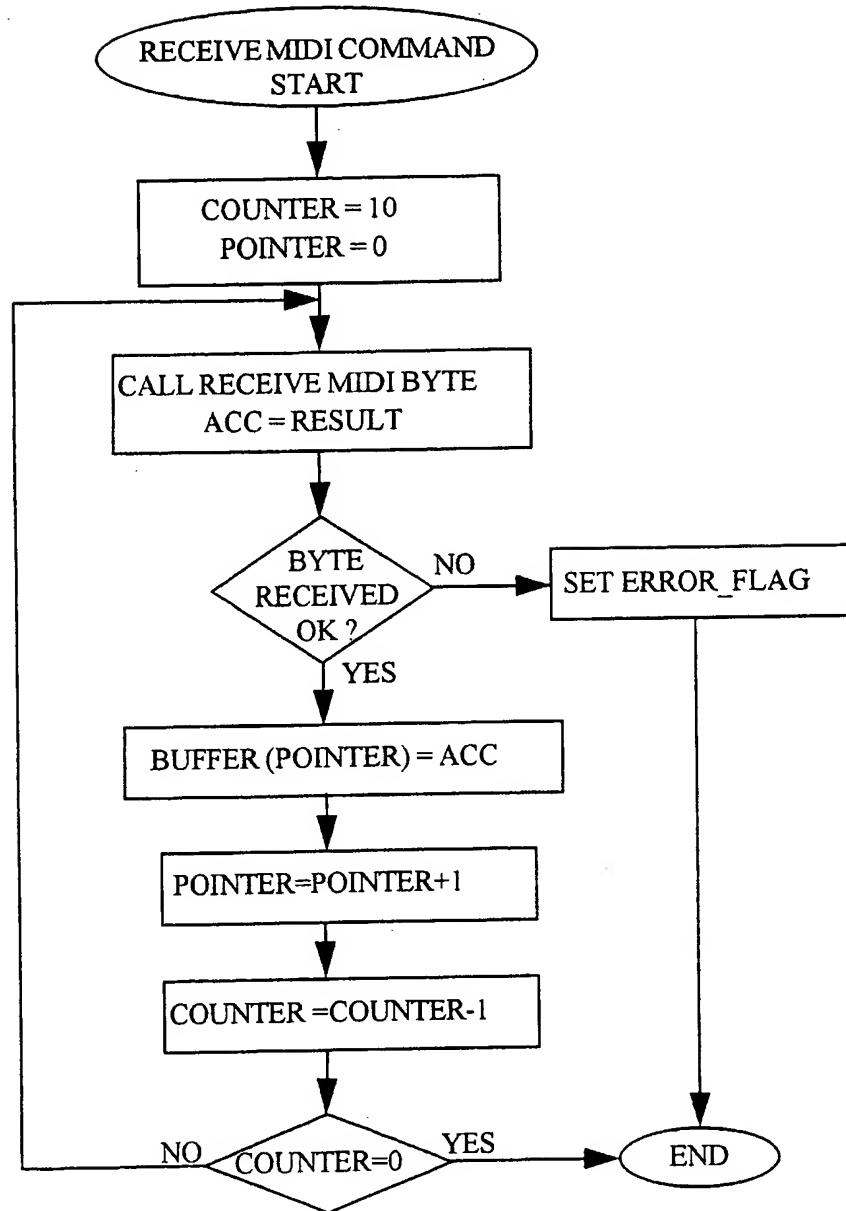
45/192

FIGURE 9E



46/192

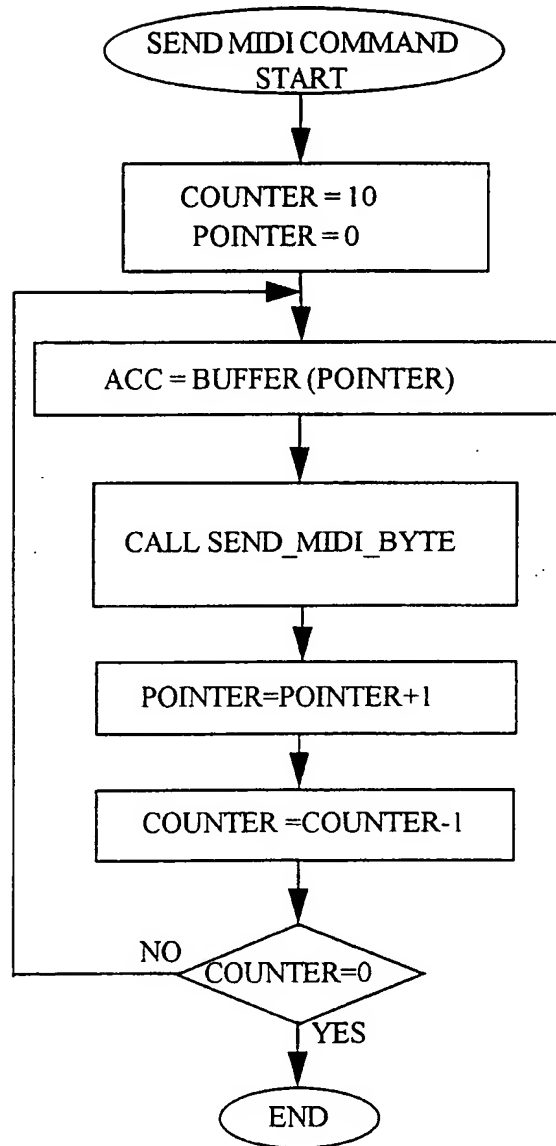
FIGURE 9F





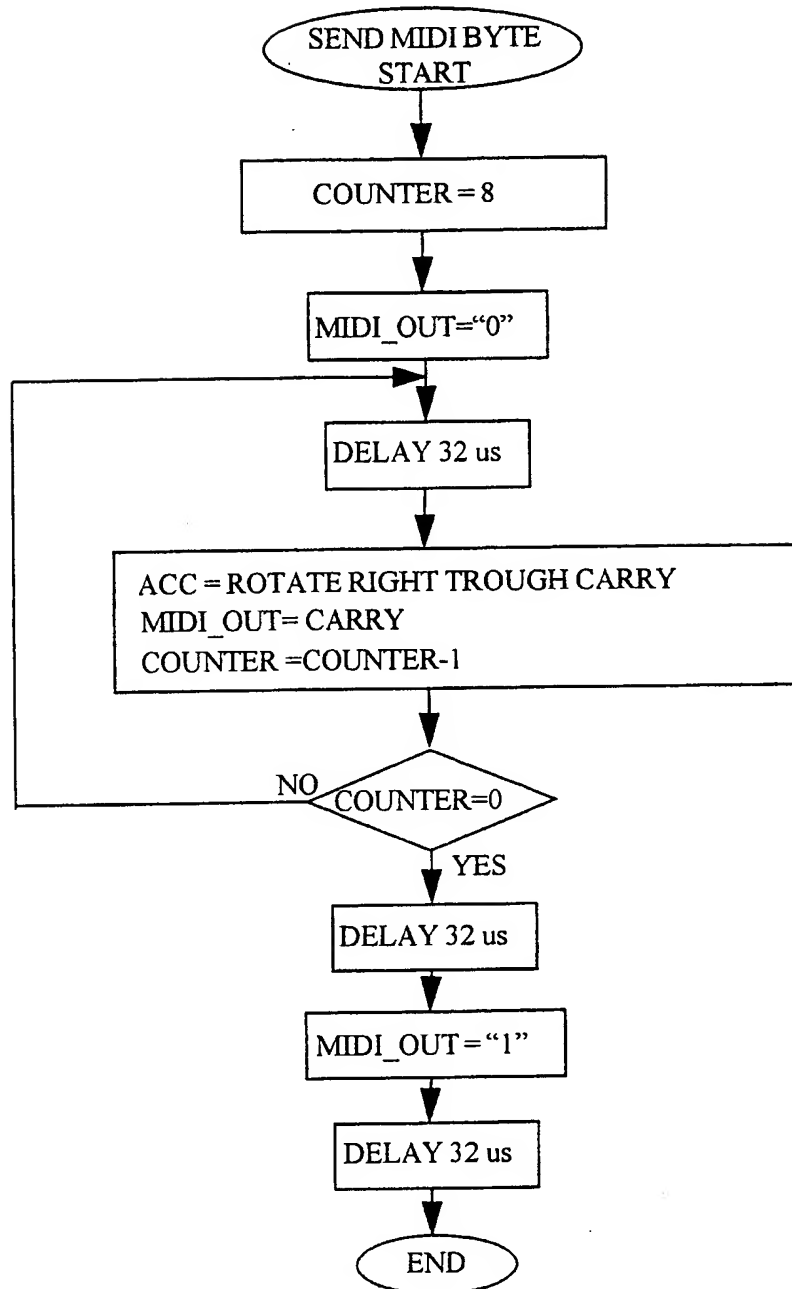
47/192

FIGURE 9G



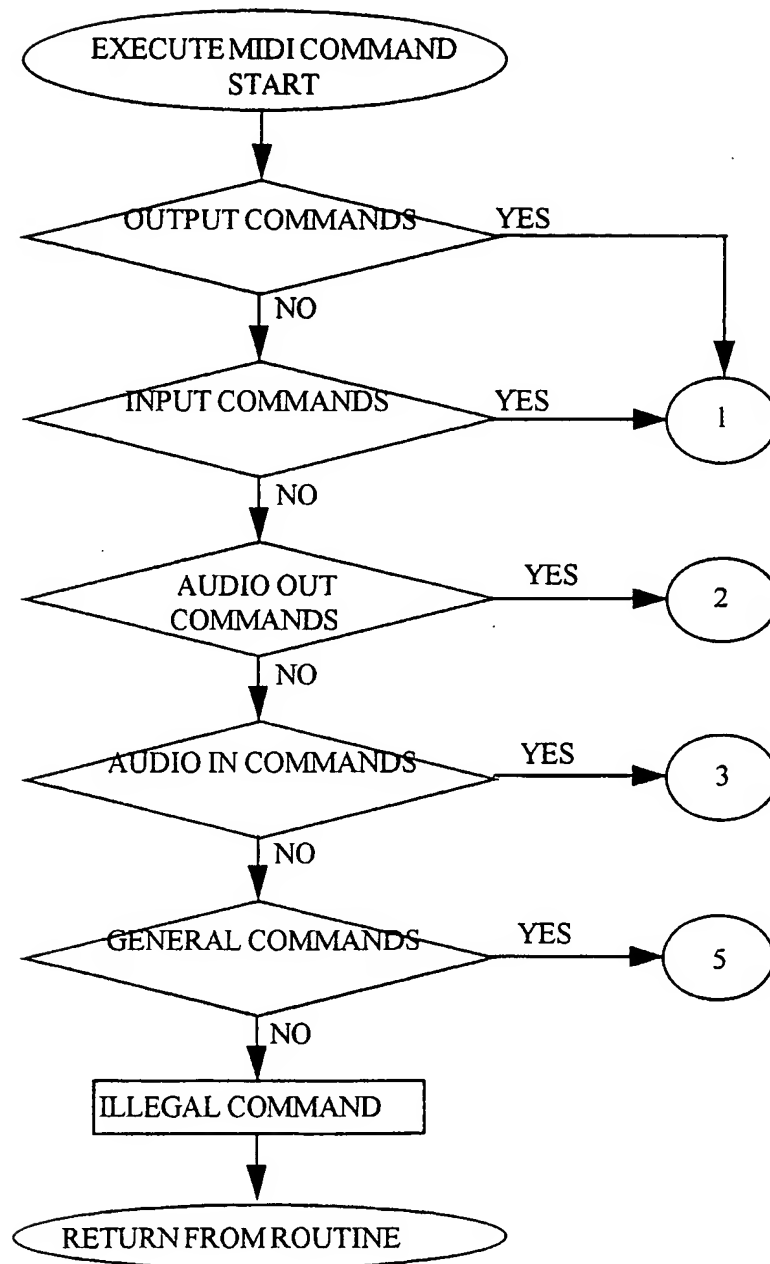
48/192

FIGURE 9H



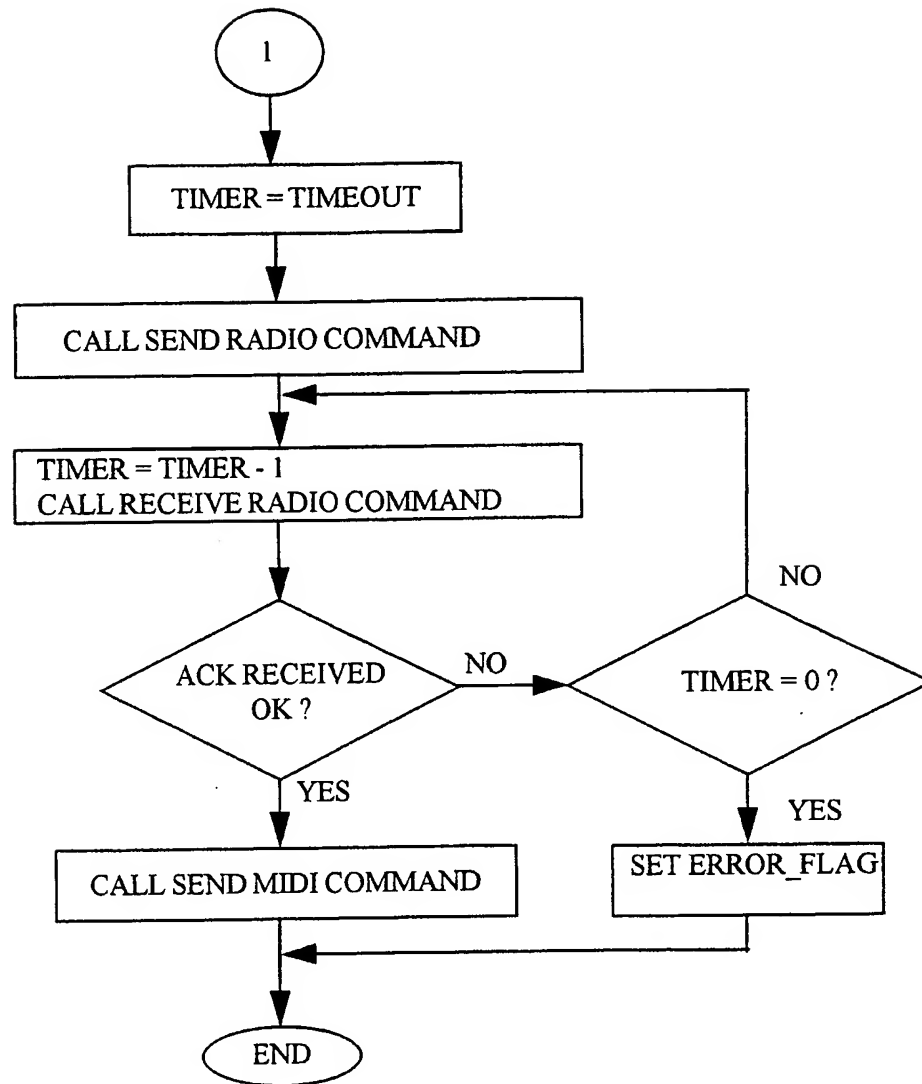
49/192

FIGURE 9I



50/192

FIGURE 9J



51/192

FIGURE 9K

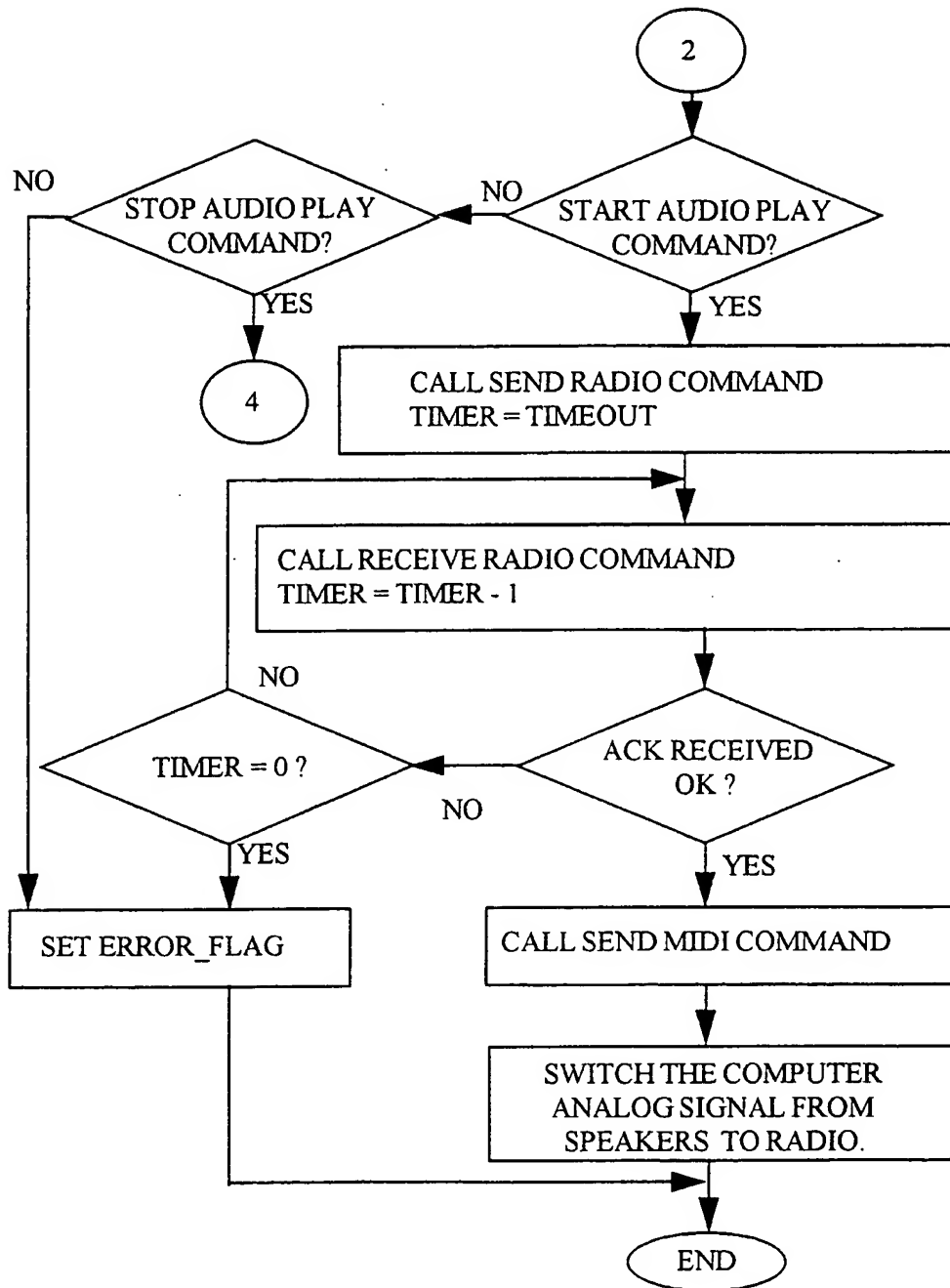
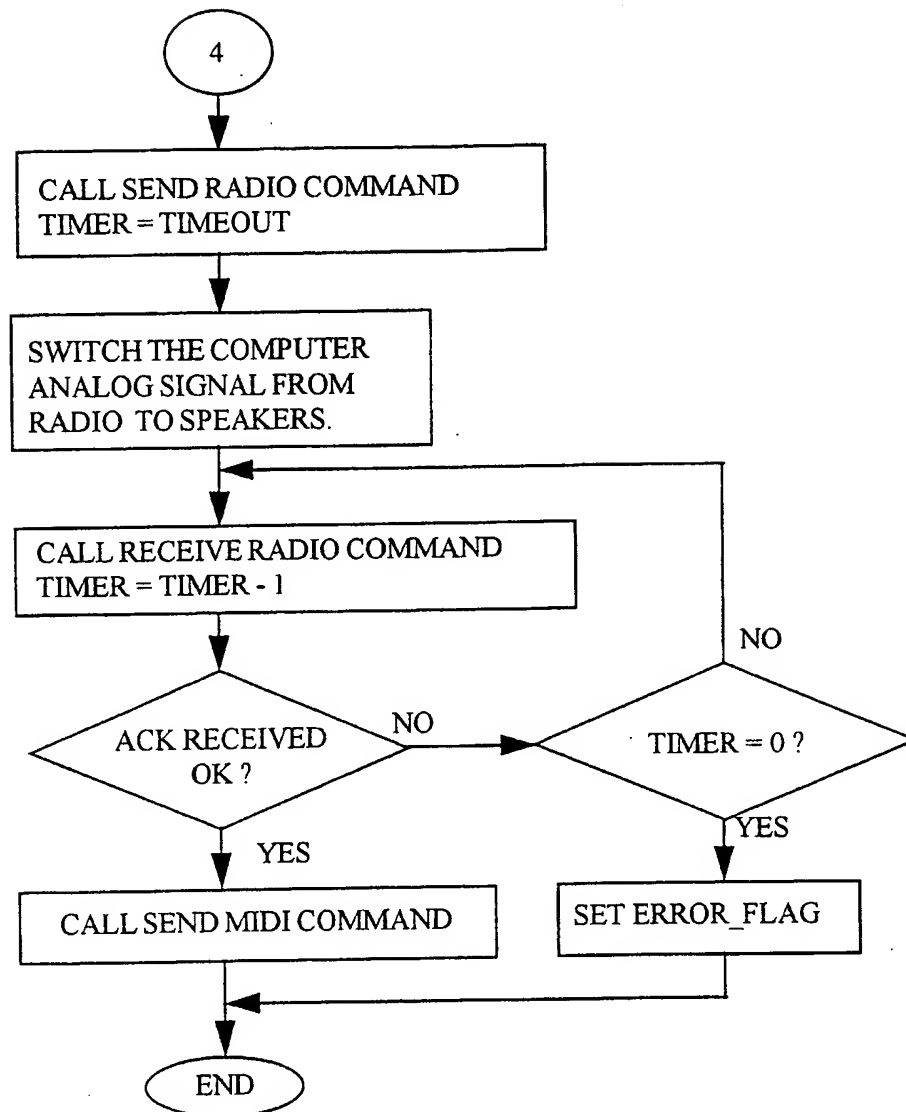
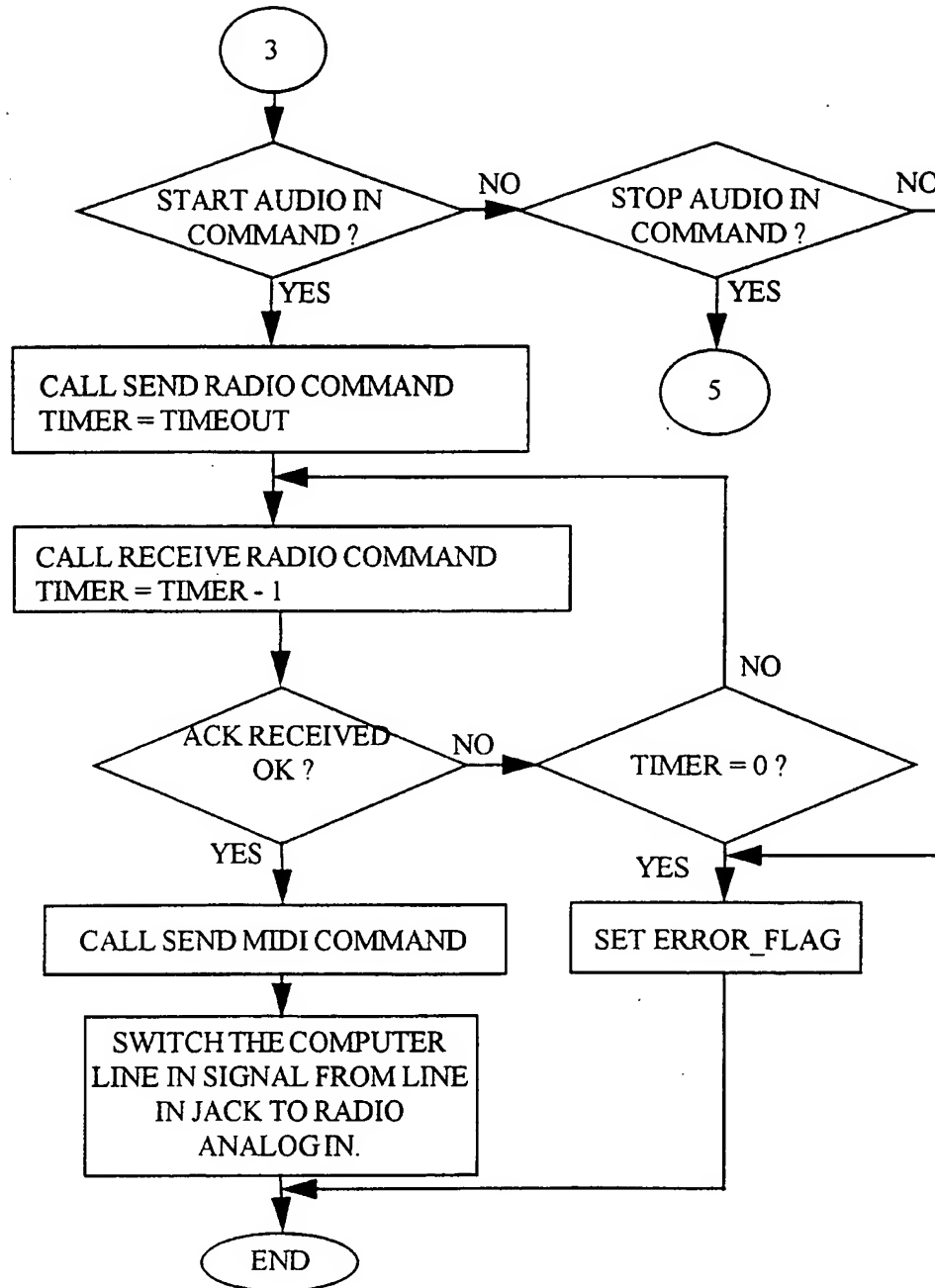


FIGURE 9L



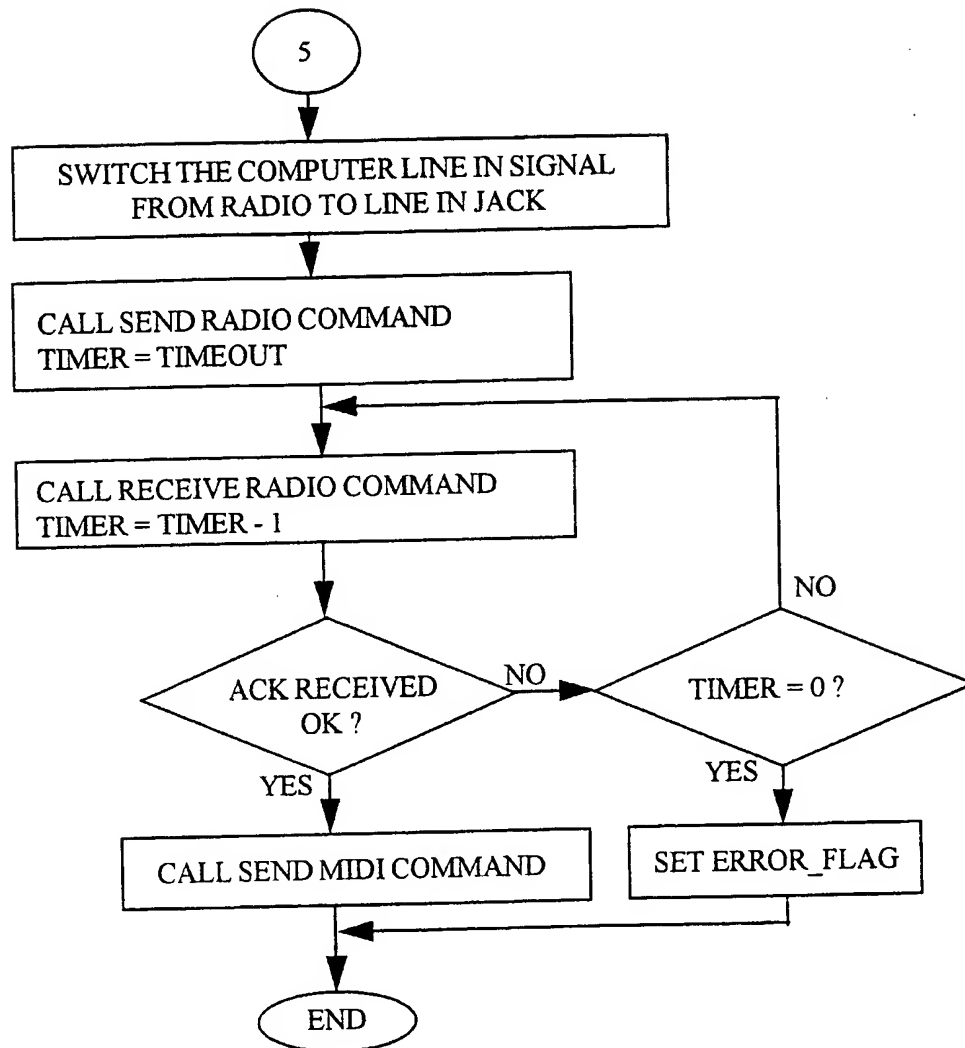
53/192

FIGURE 9M



54/192

FIGURE 9N





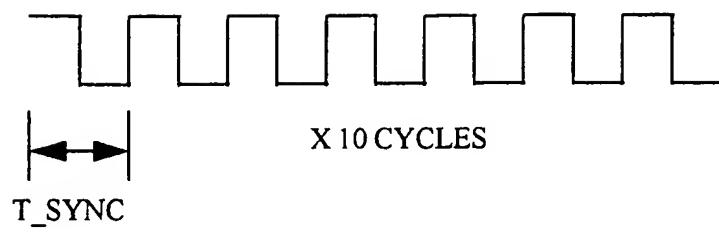


FIGURE 10A

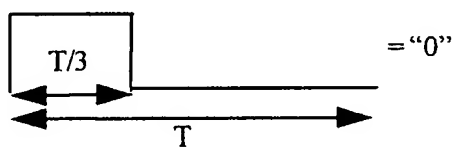


FIGURE 10B

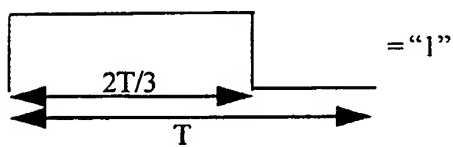
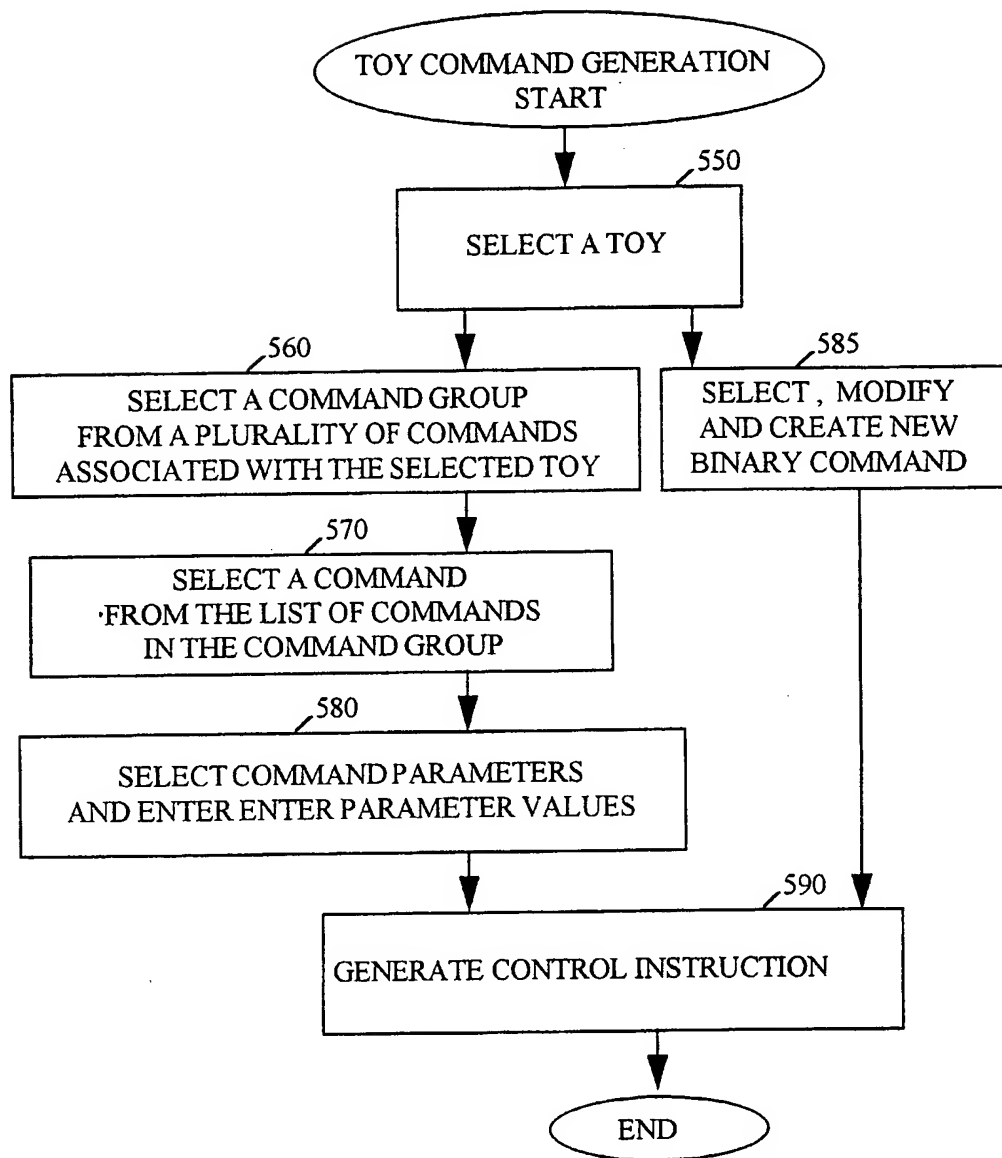


FIGURE 10C

56/192

FIGURE 11



57/192

FIGURE 12A

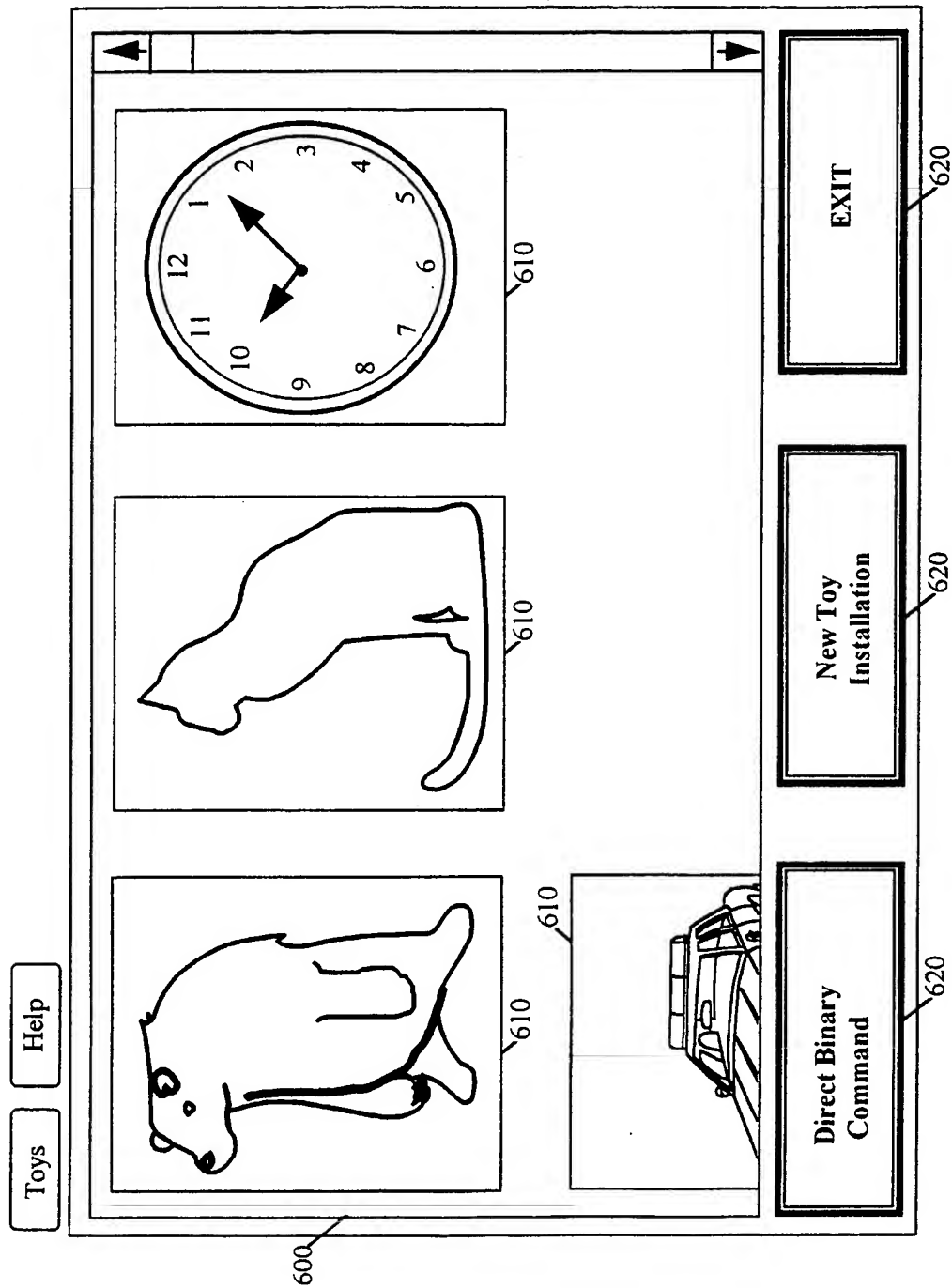
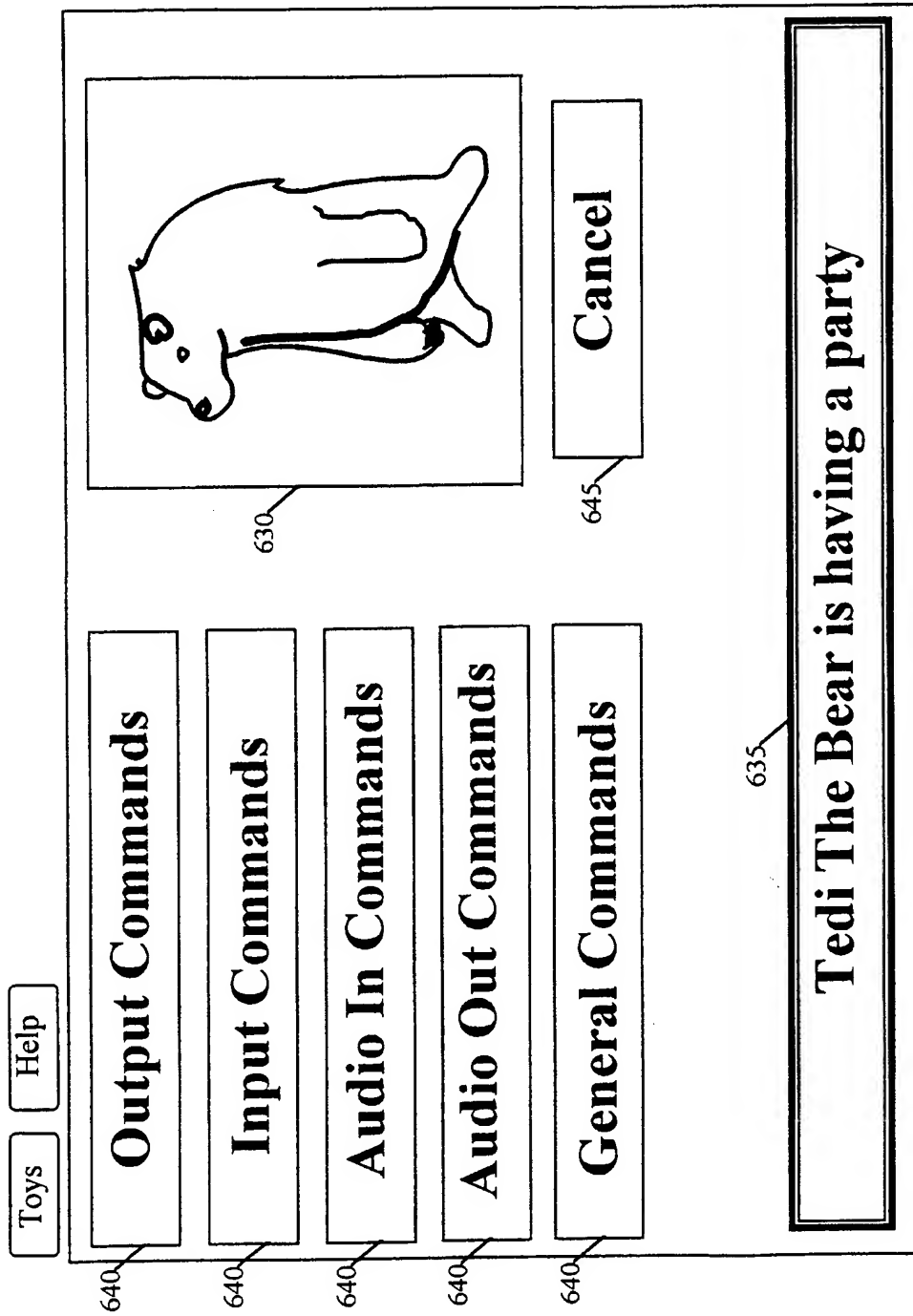


FIGURE 12B



59/192

FIGURE 12C

Toys

Help

FILE NAME:

TBEAR031.CTR

OUTPUT  
COMMANDS:

OPEN MOUTH

CLOSE MOUTH

MOVE RIGHT LEG

MOVE LEFT LEG

OPEN & CLOSE EYES

CRY

WALK

CLOSE EYES

MOVE RIGHT ARM

MOVE LEFT ARM

OPEN EYES

650

MOVE UP

MOVE DOWN

665

30 Sec

OK

DURATION :

CANCEL

CANCEL

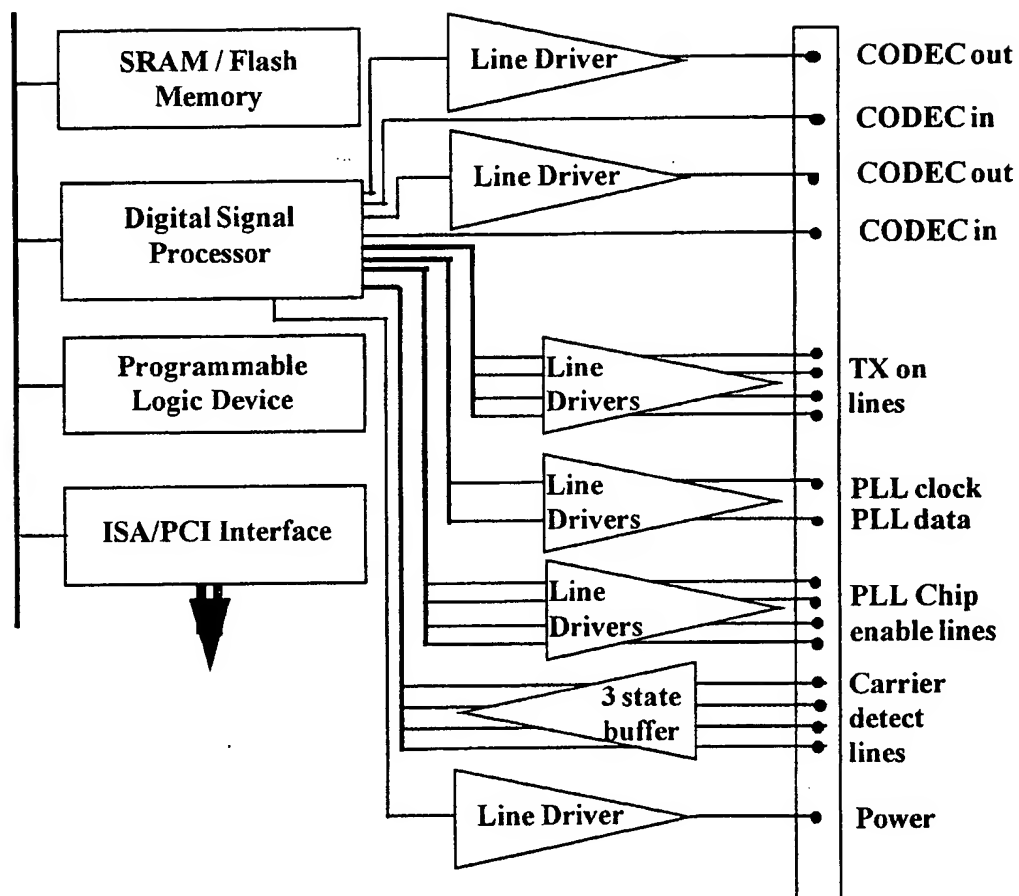
MAKE

645

660

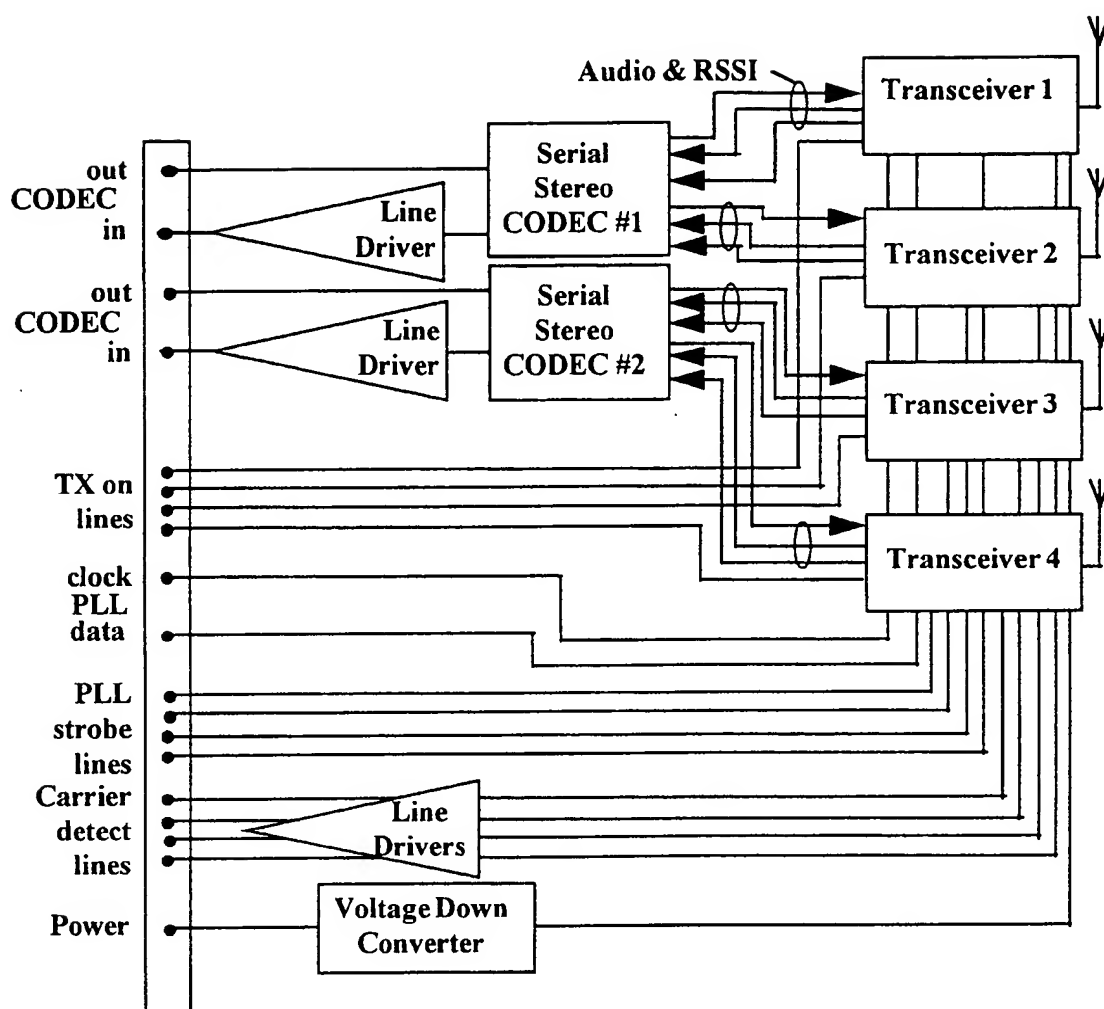
60/192

FIGURE 13



61/192

FIGURE 14



62/192

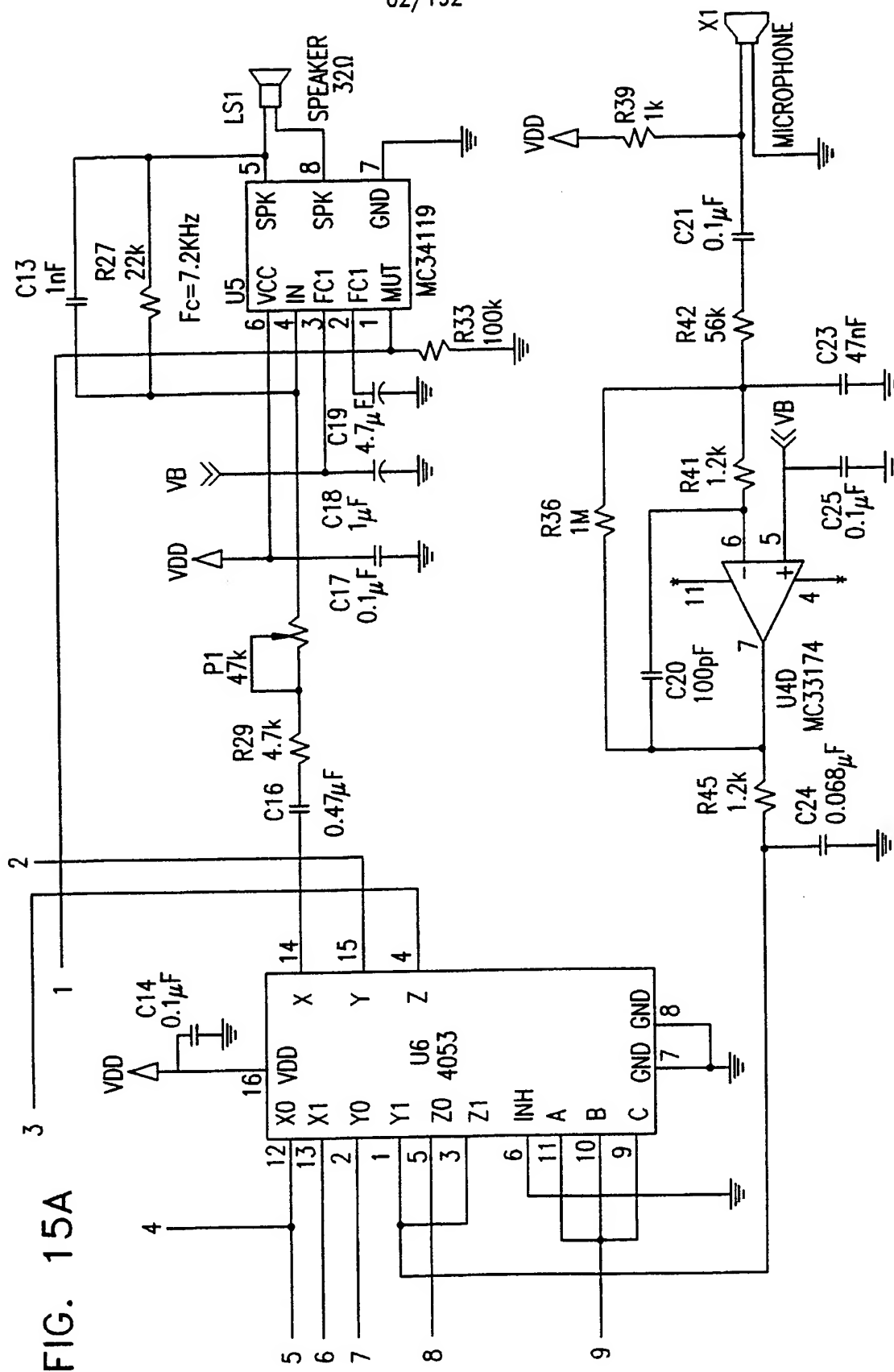


FIG. 15A



63/192

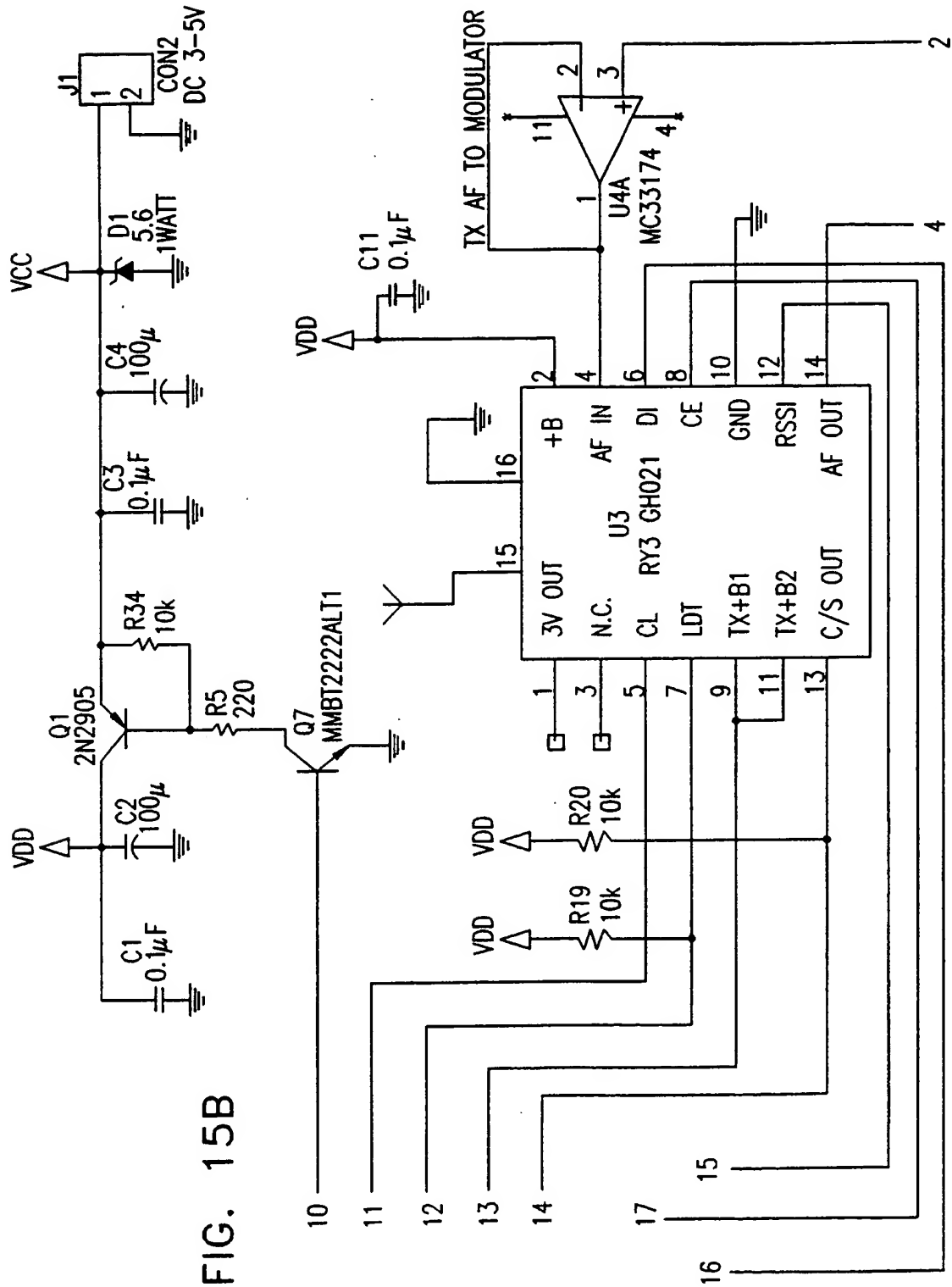


FIG. 15C

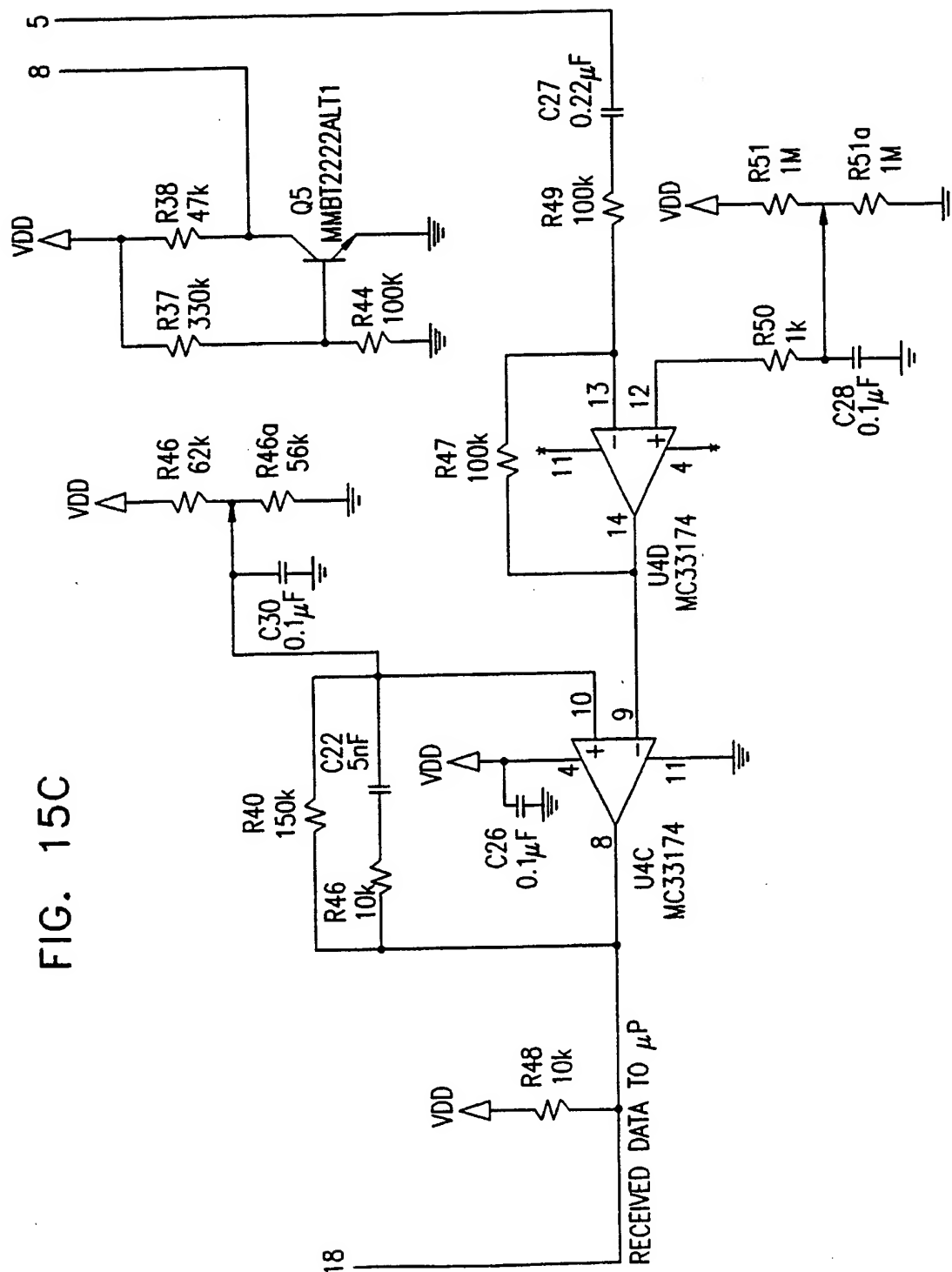
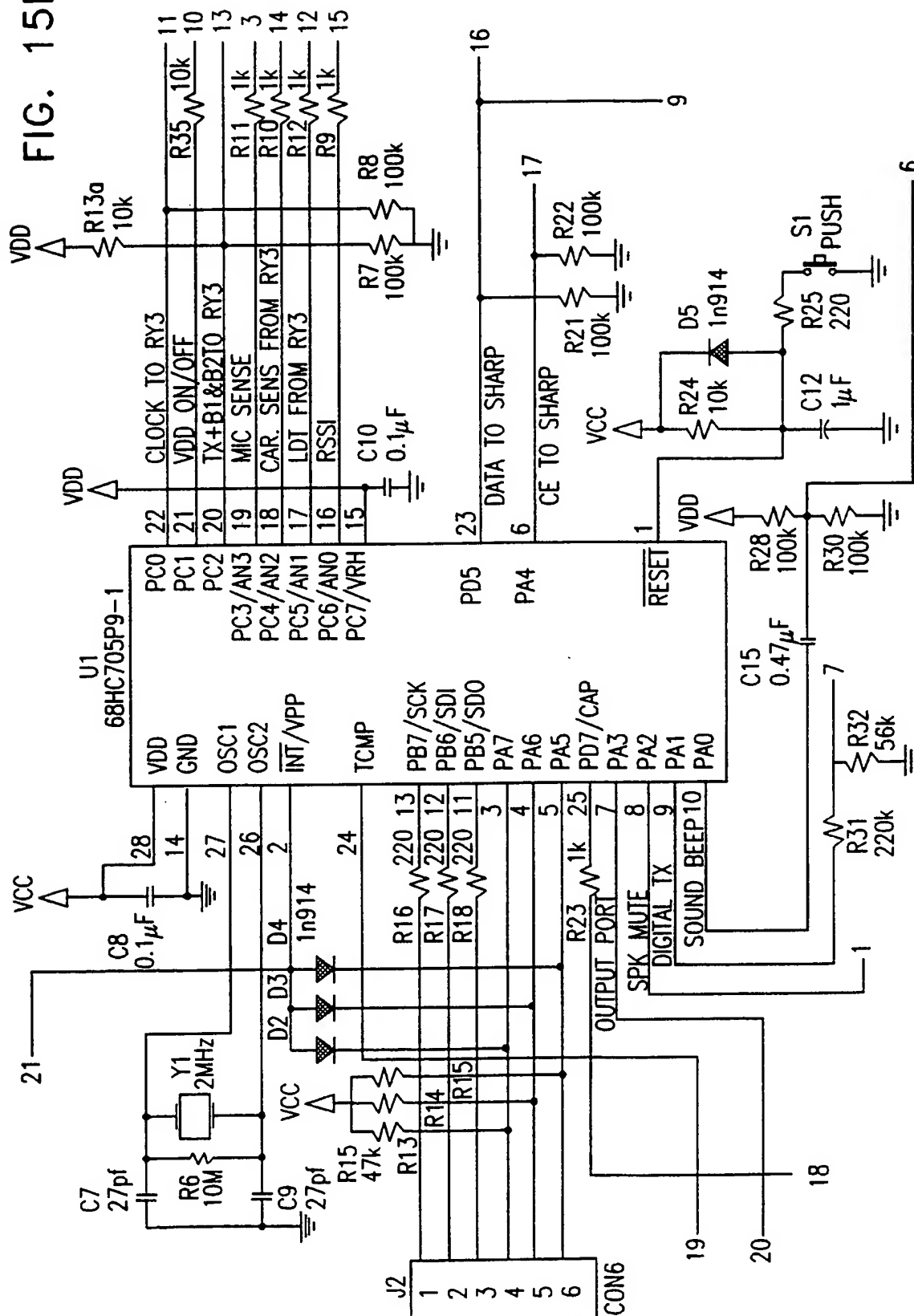
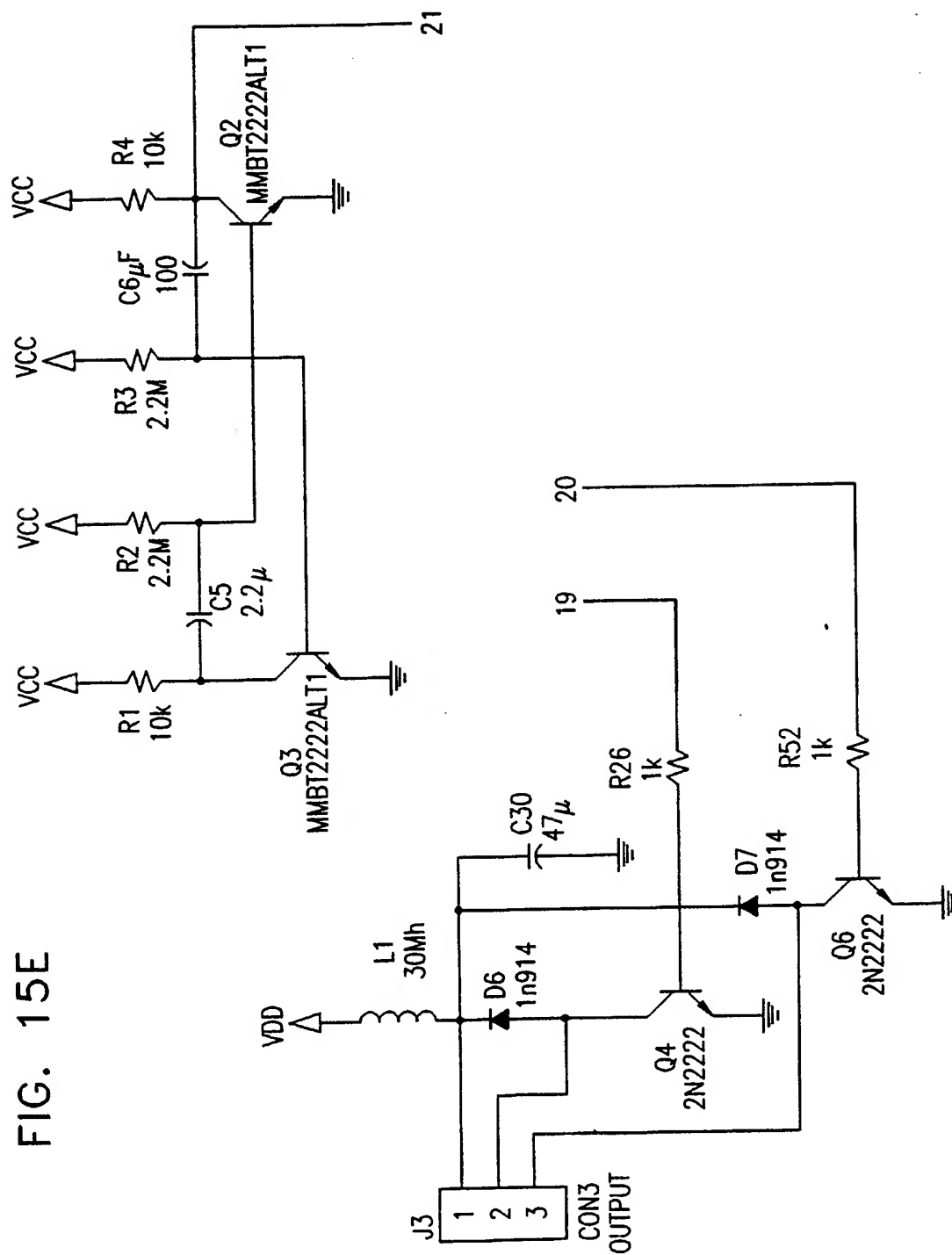


FIG. 15D

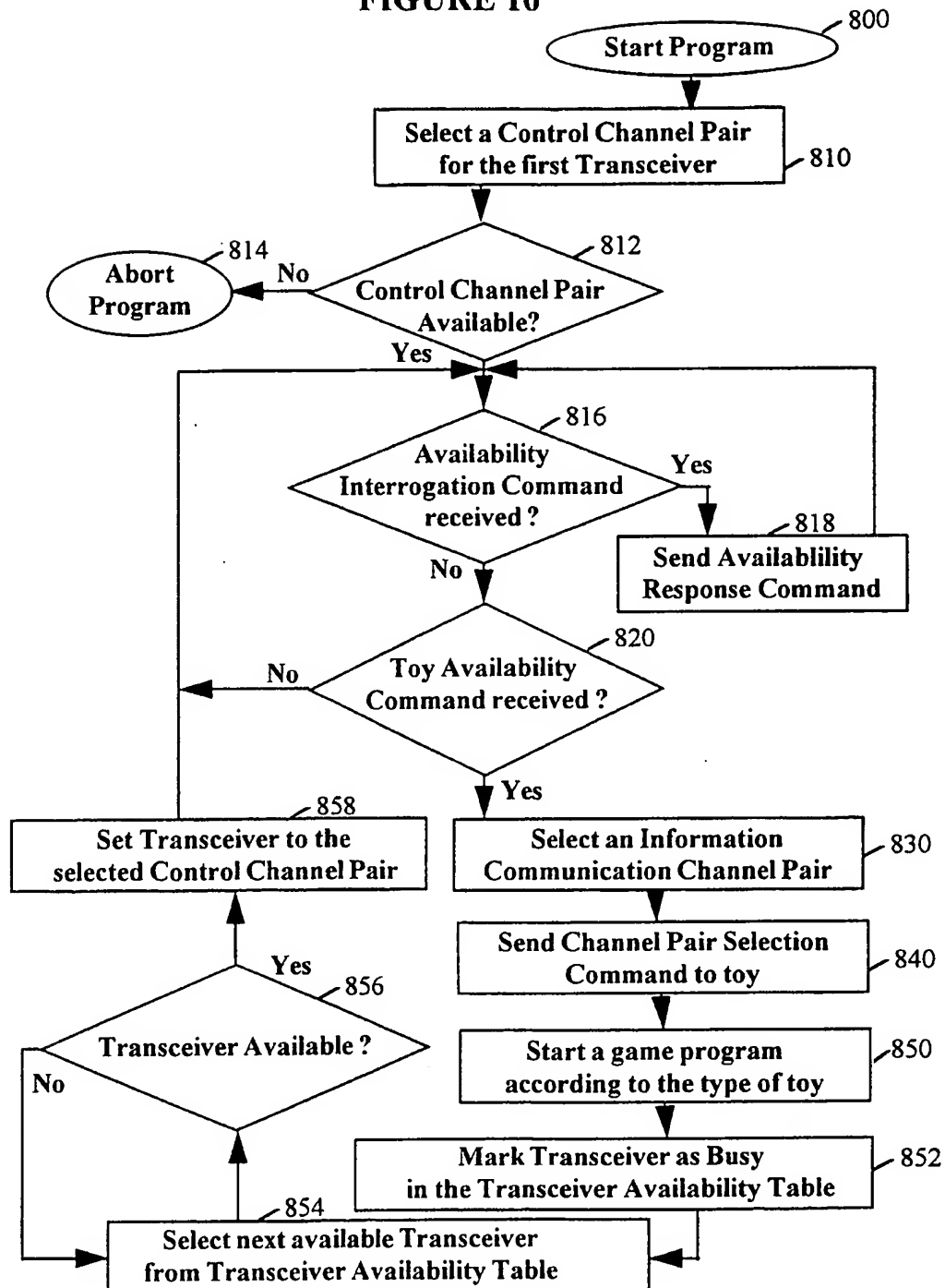


**FIG. 15E**



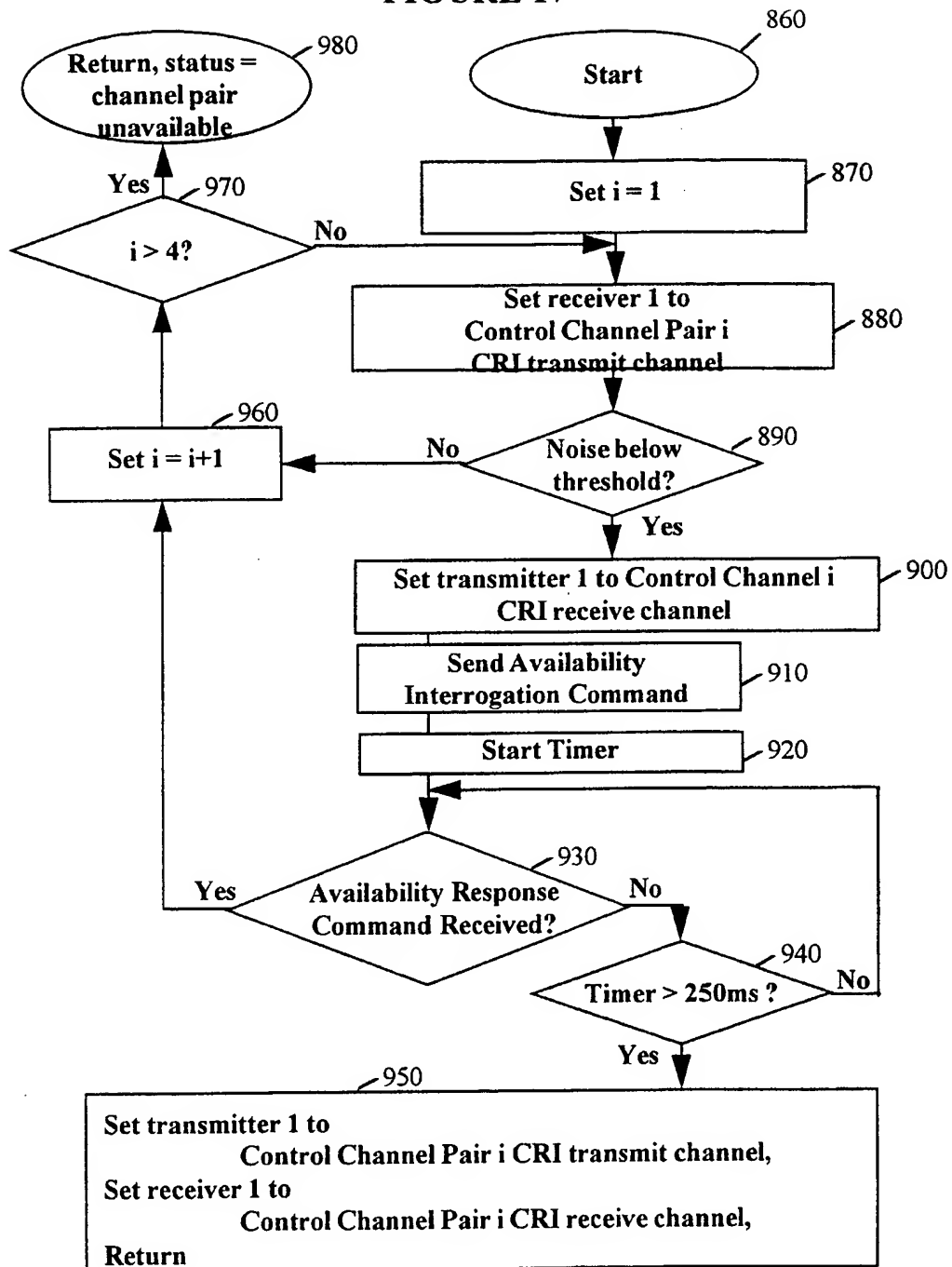
67/192

FIGURE 16



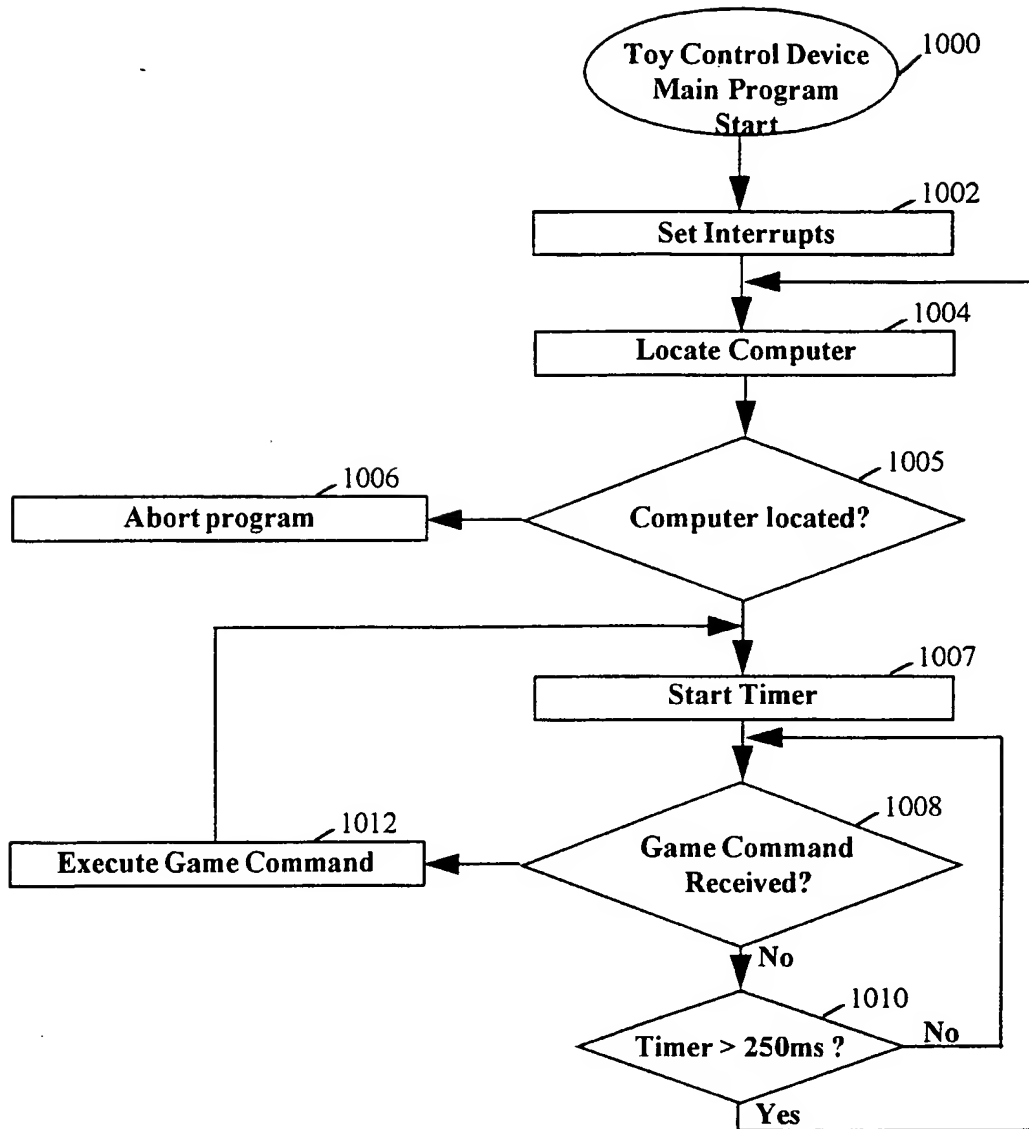
68/192

FIGURE 17



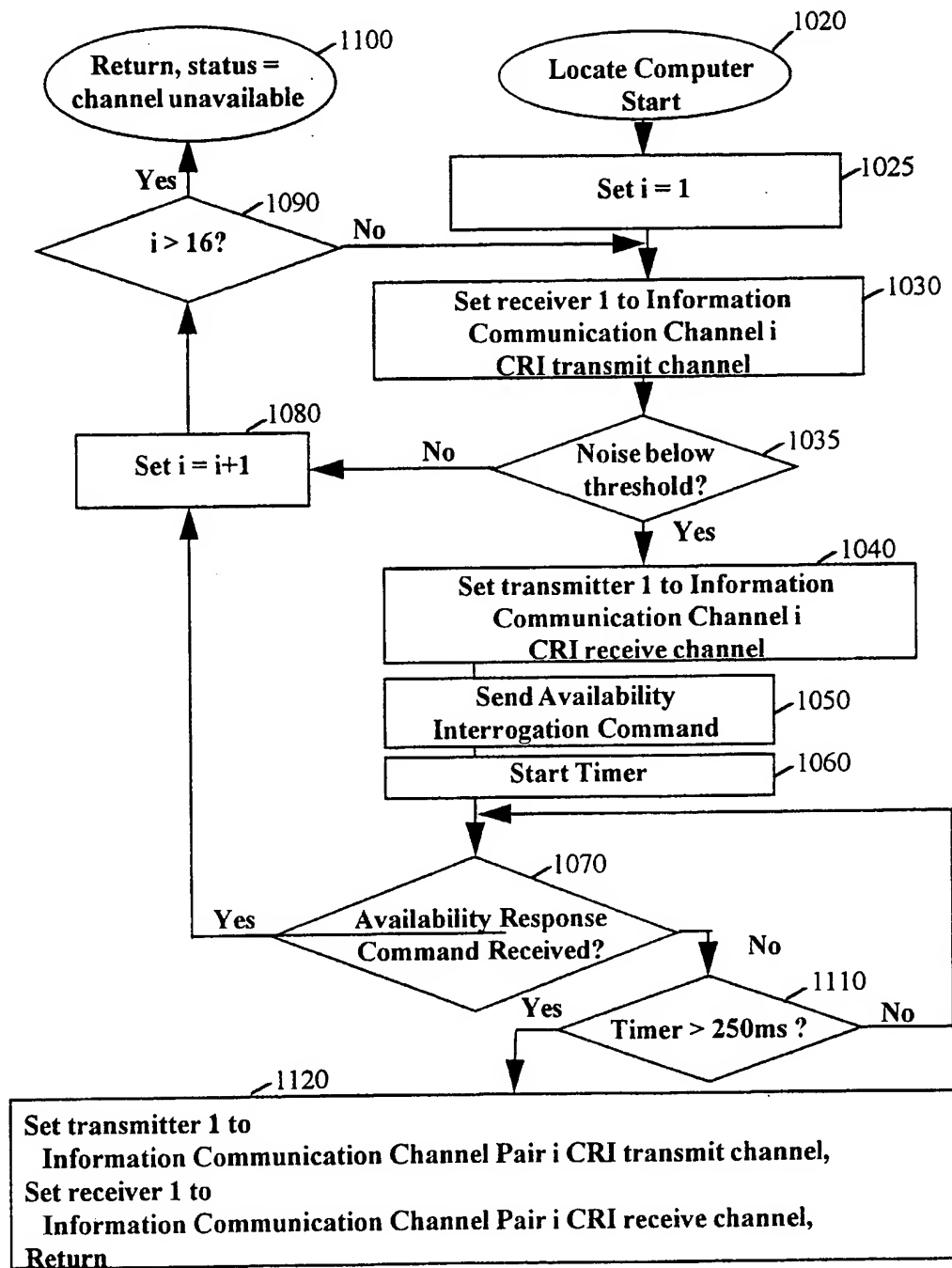
69/192

FIGURE 18A



70/192

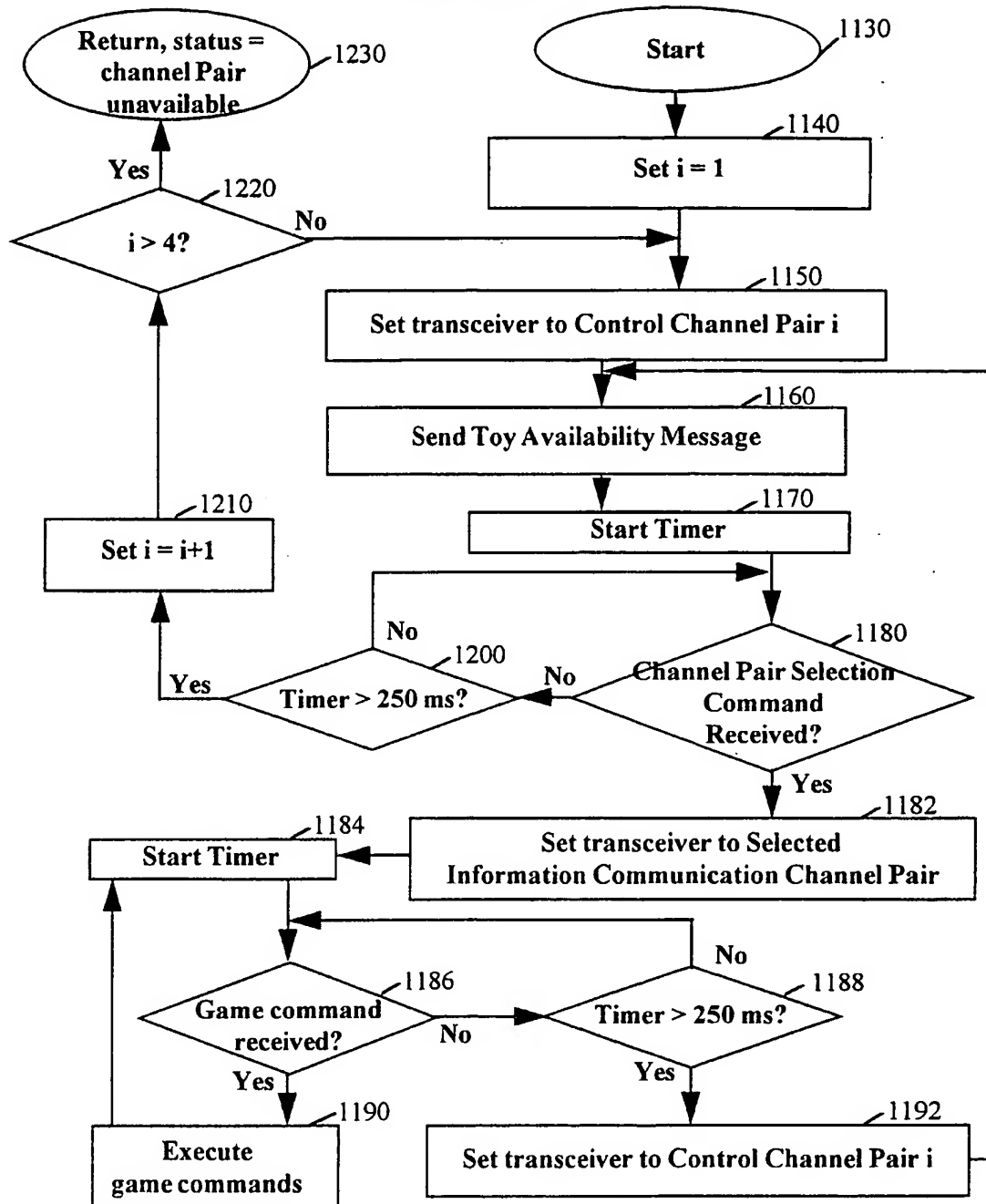
FIGURE 18B





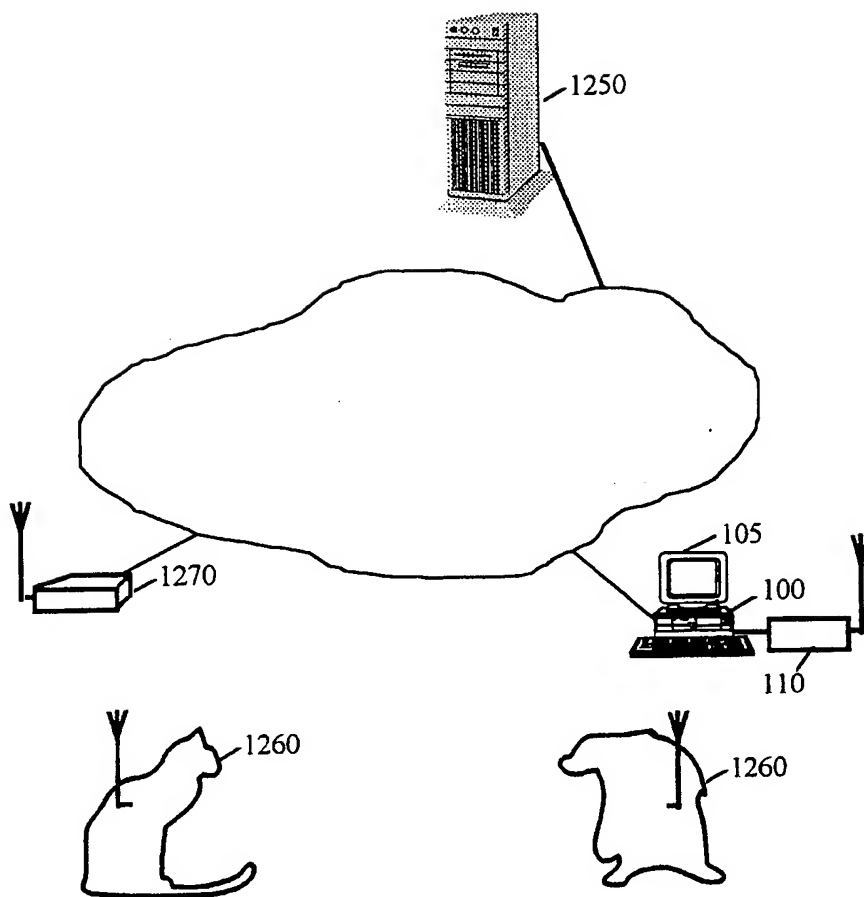
71/192

FIGURE 19



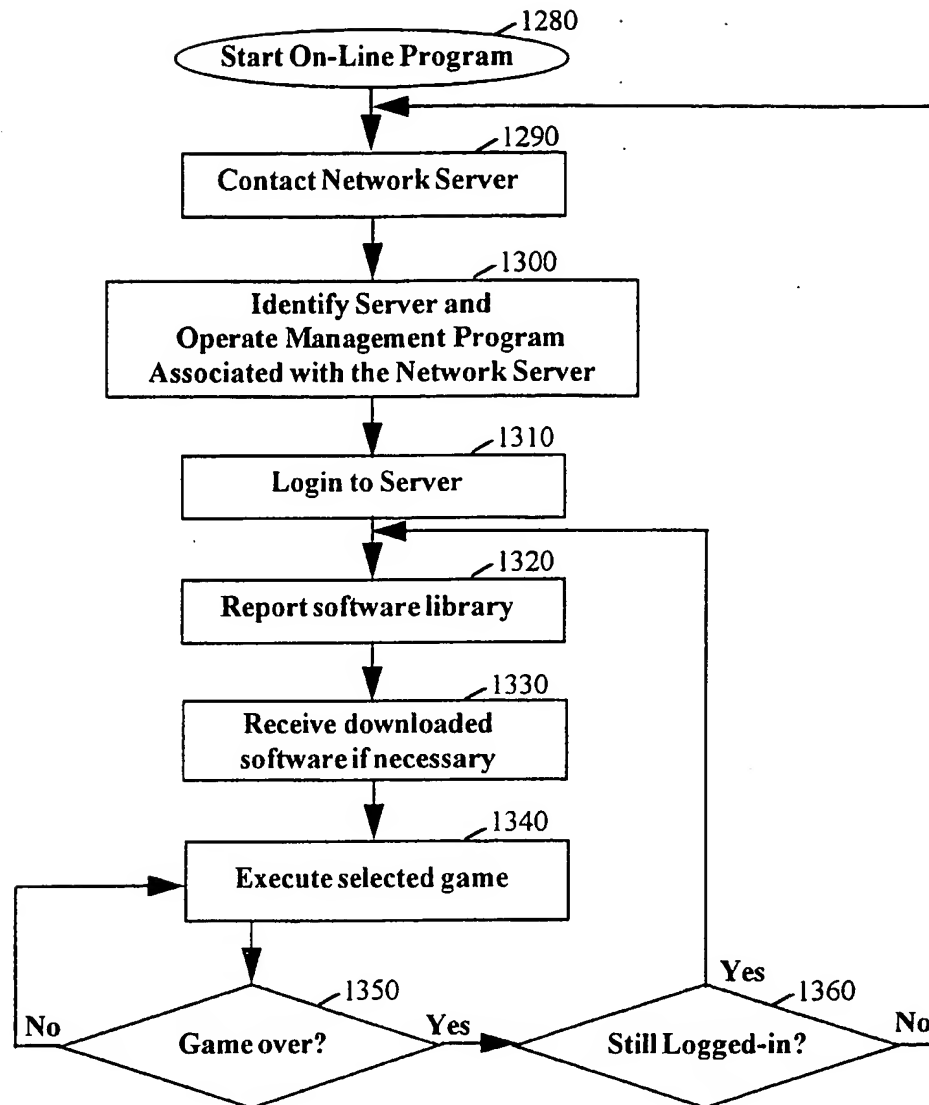
72/192

FIGURE 20



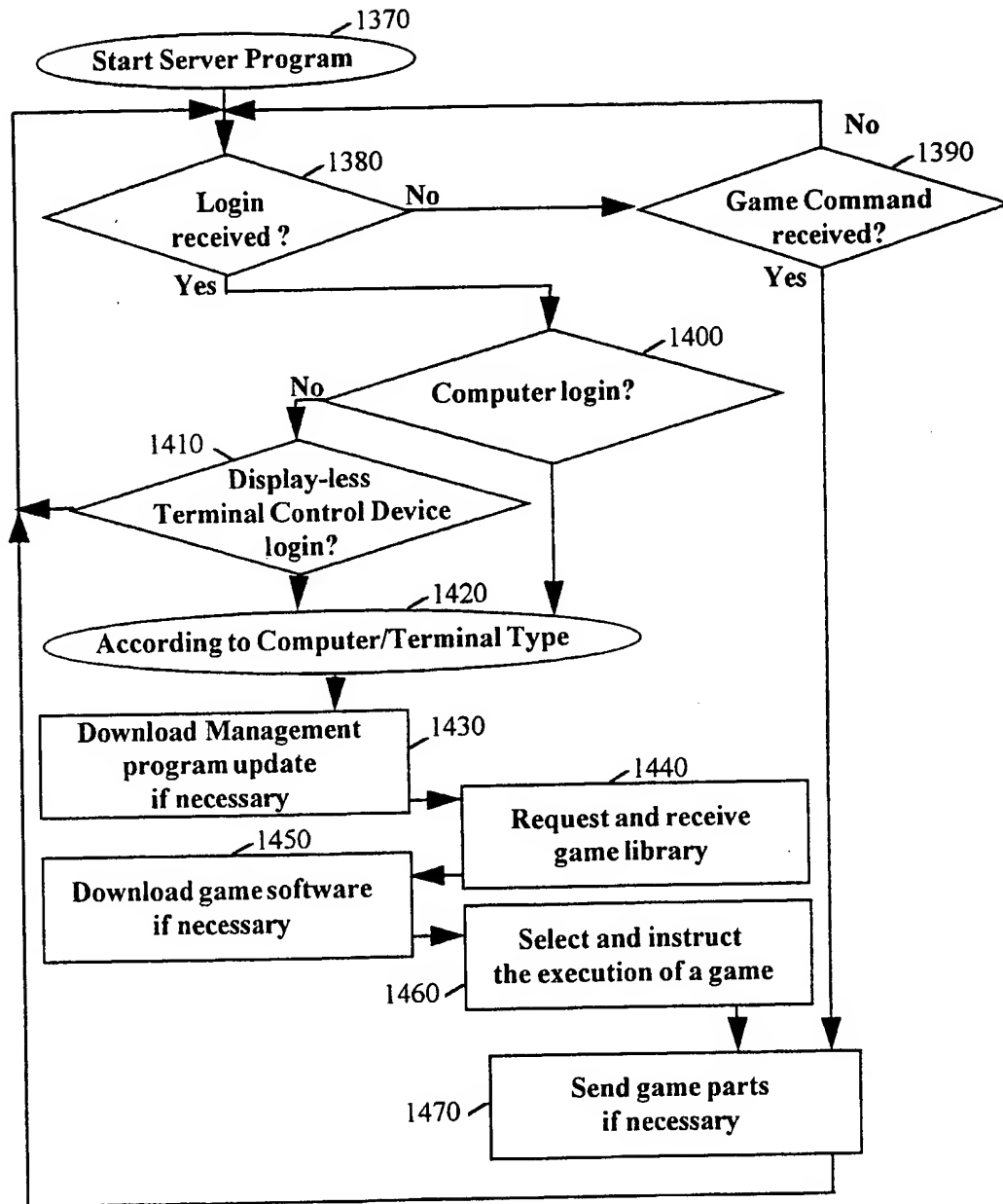
73/192

FIGURE 21



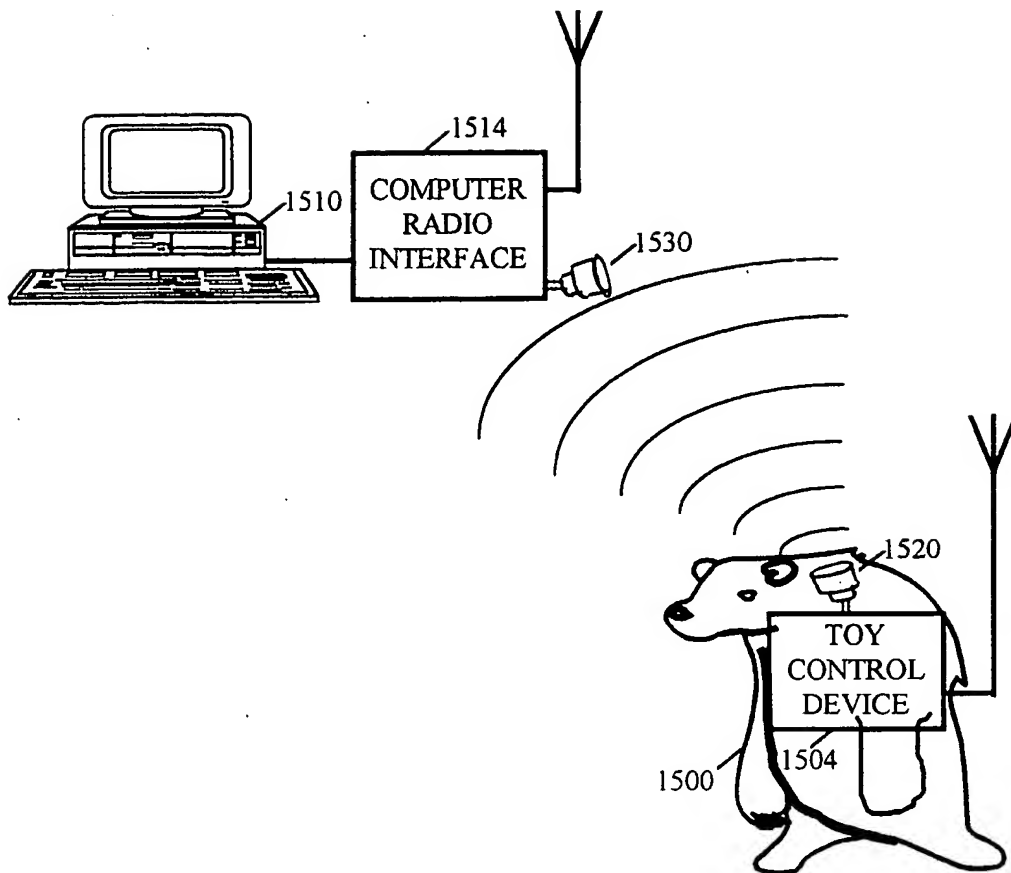
74/192

FIGURE 22



75/192

FIGURE 23



76/192

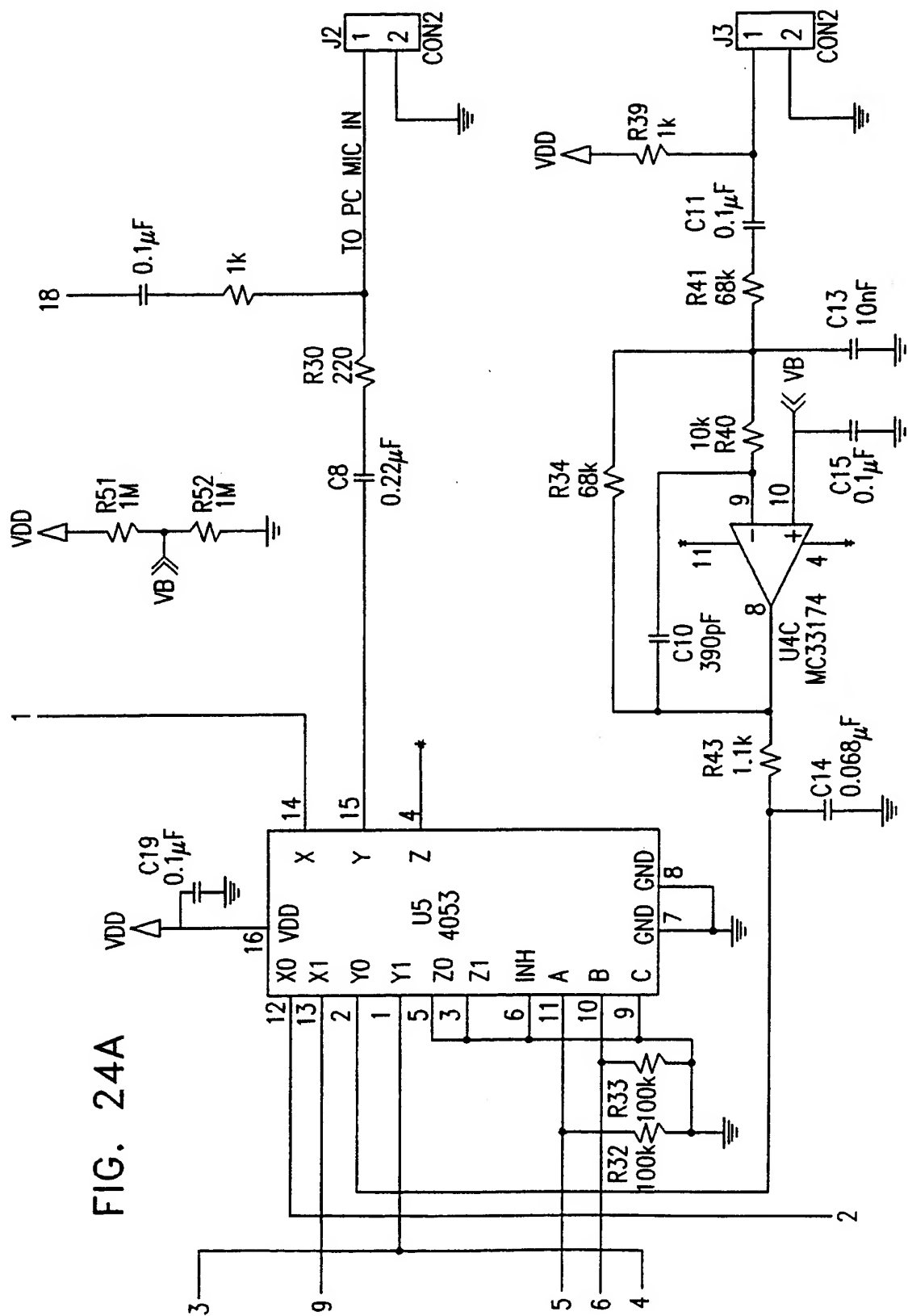
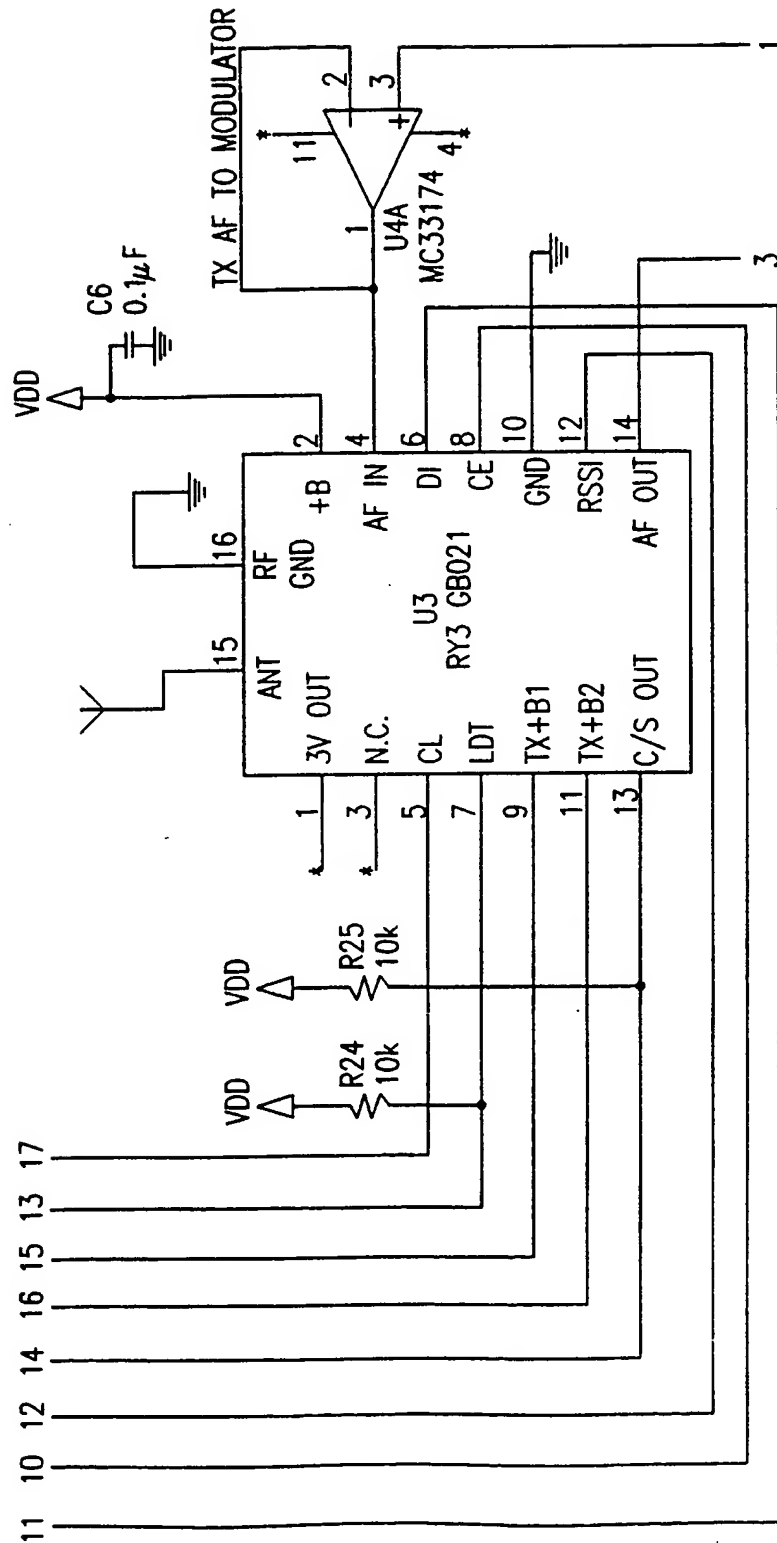


FIG. 24A

77/192

FIG. 24B



78/192

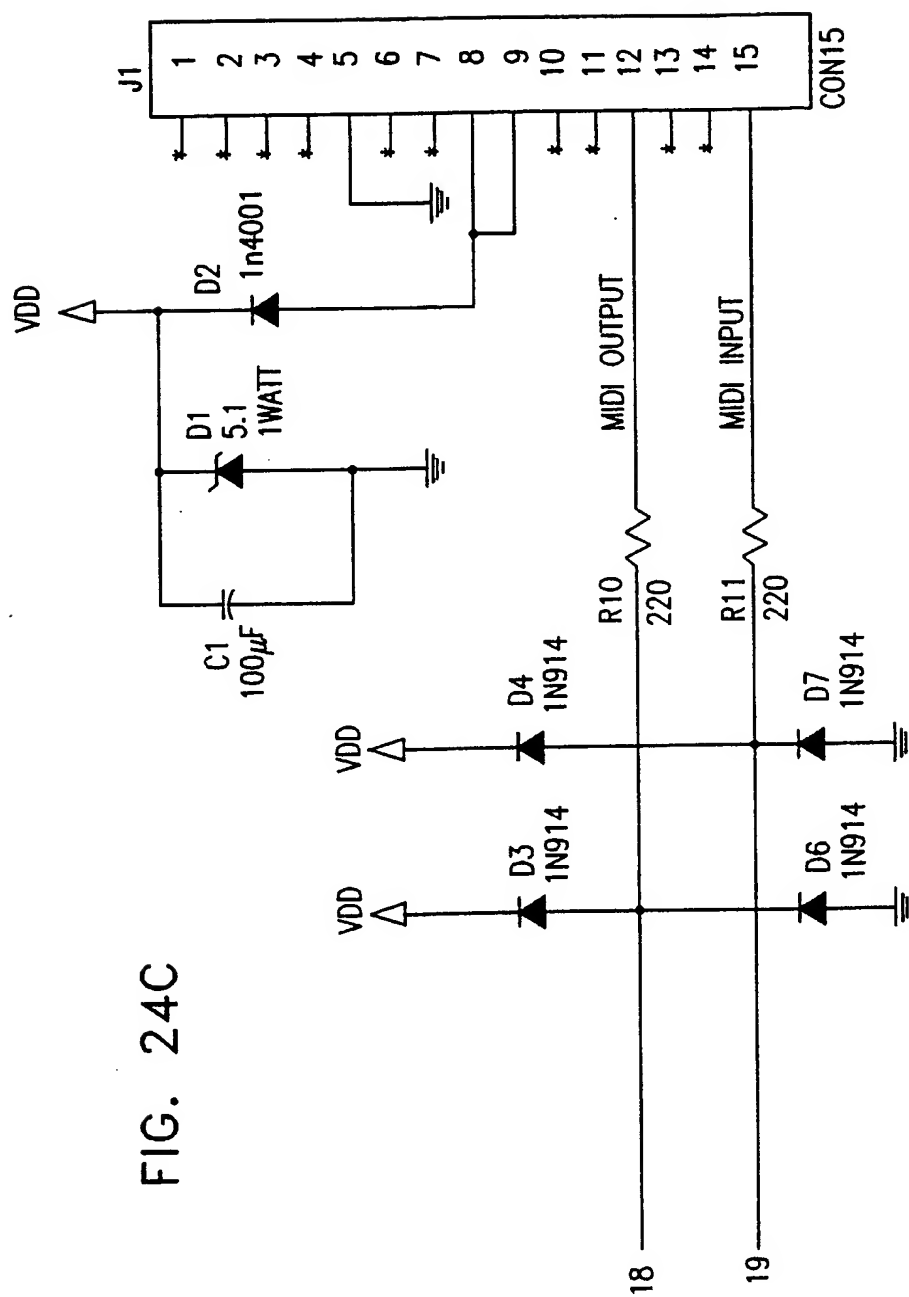
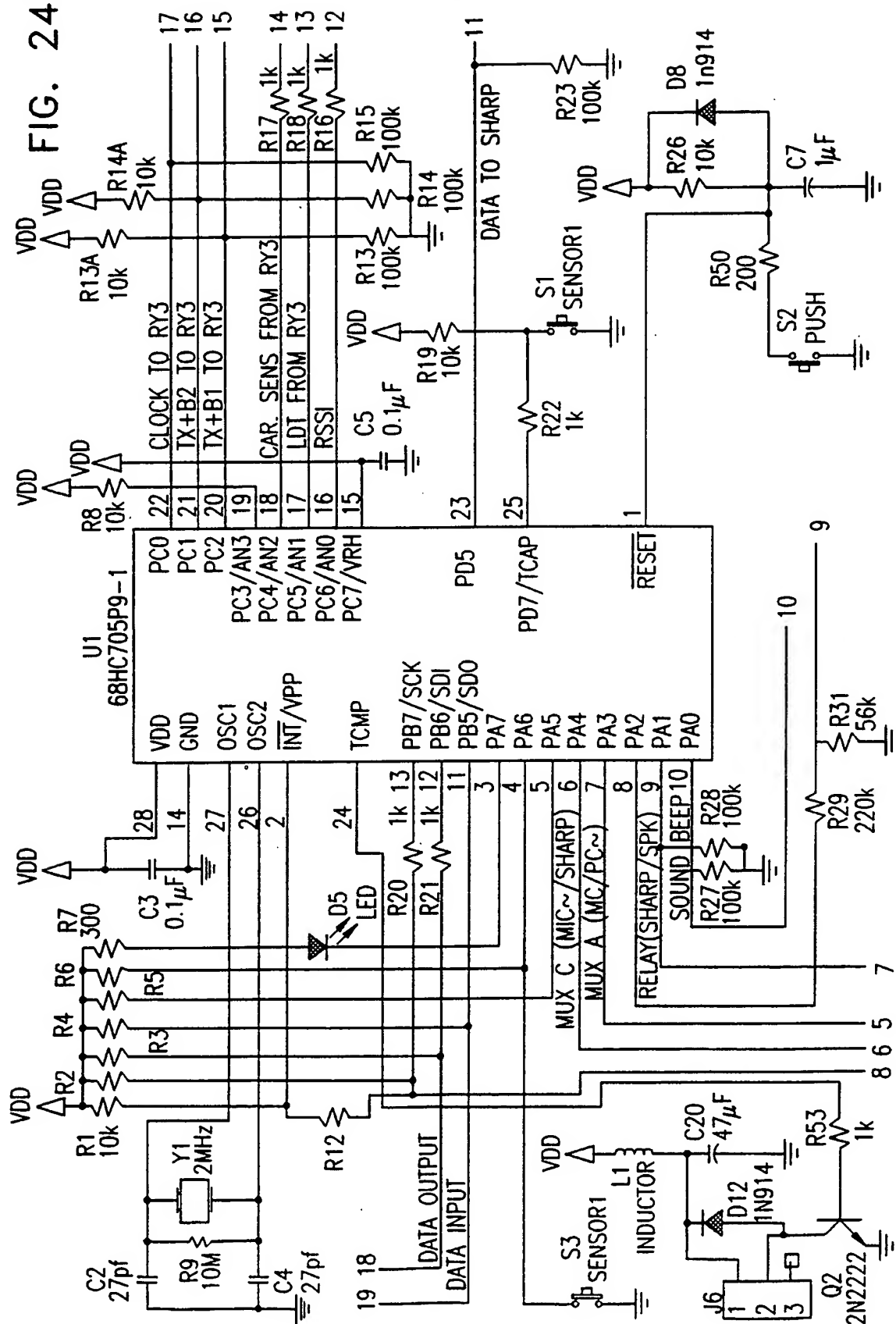


FIG. 24C



FIG. 24D

79/192



80/192

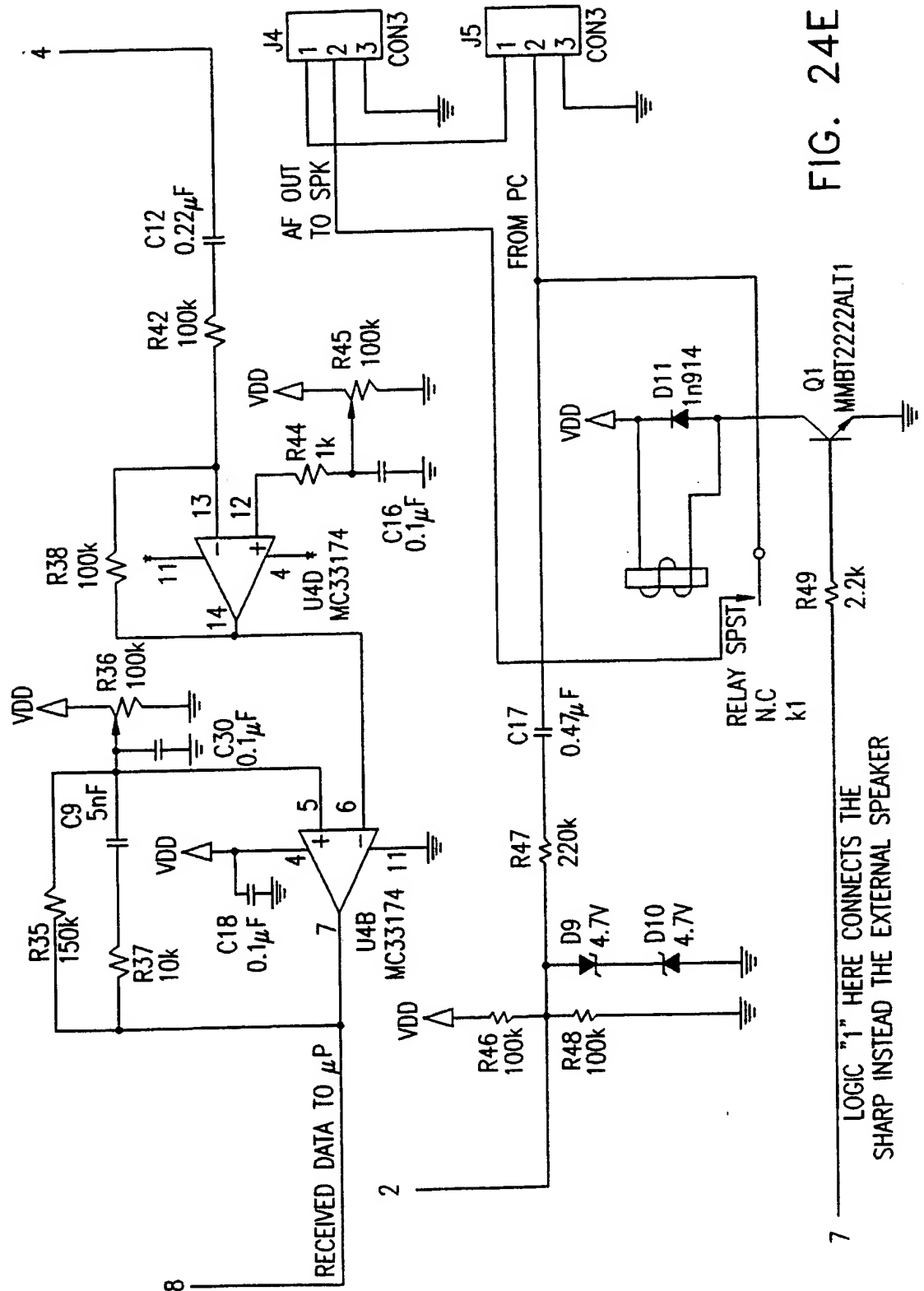
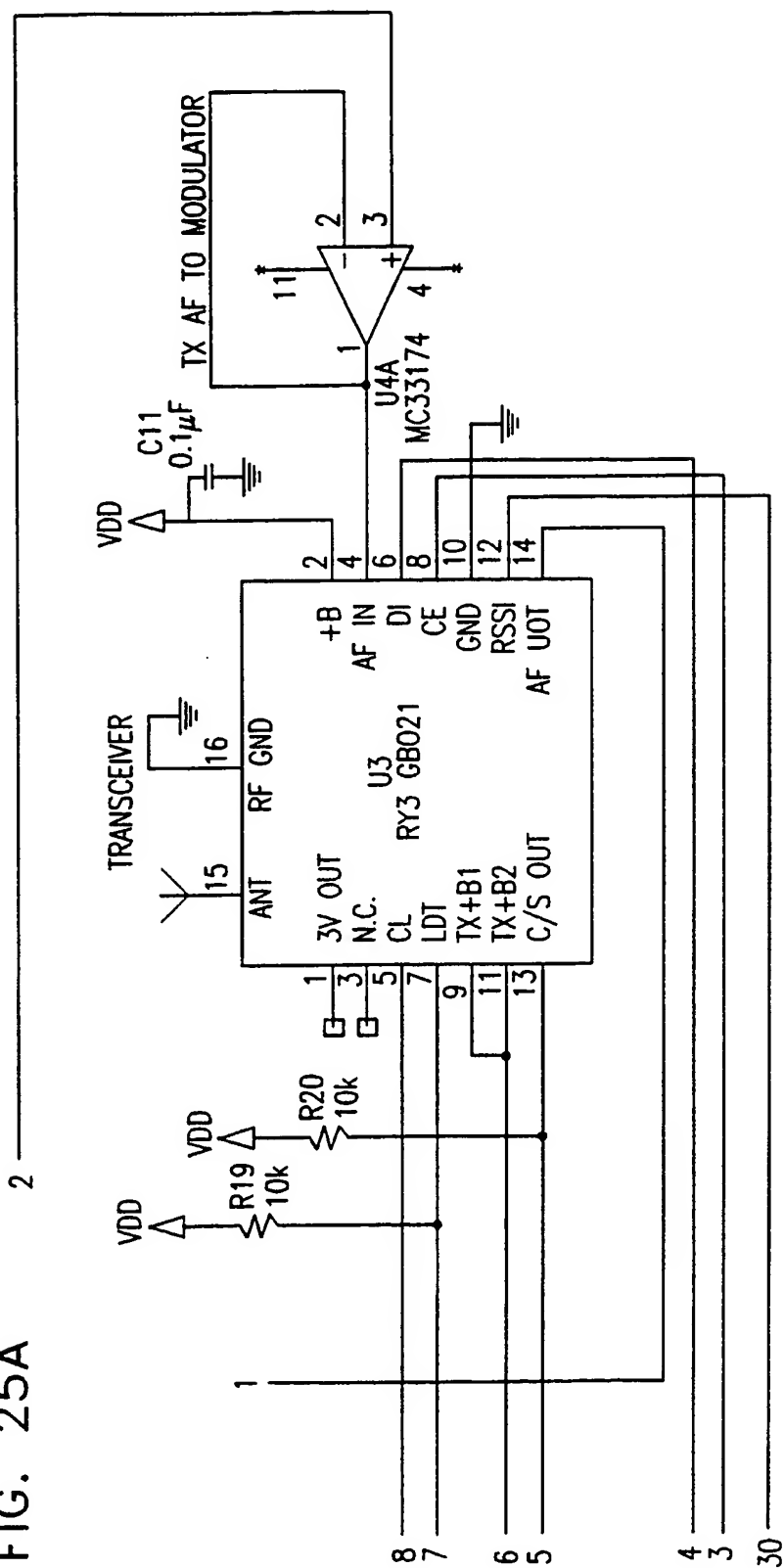


FIG. 24E

7 — LOGIC "1" HERE CONNECTS THE SHARP INSTEAD THE EXTERNAL SPEAKER

**FIG. 25A**



82/192

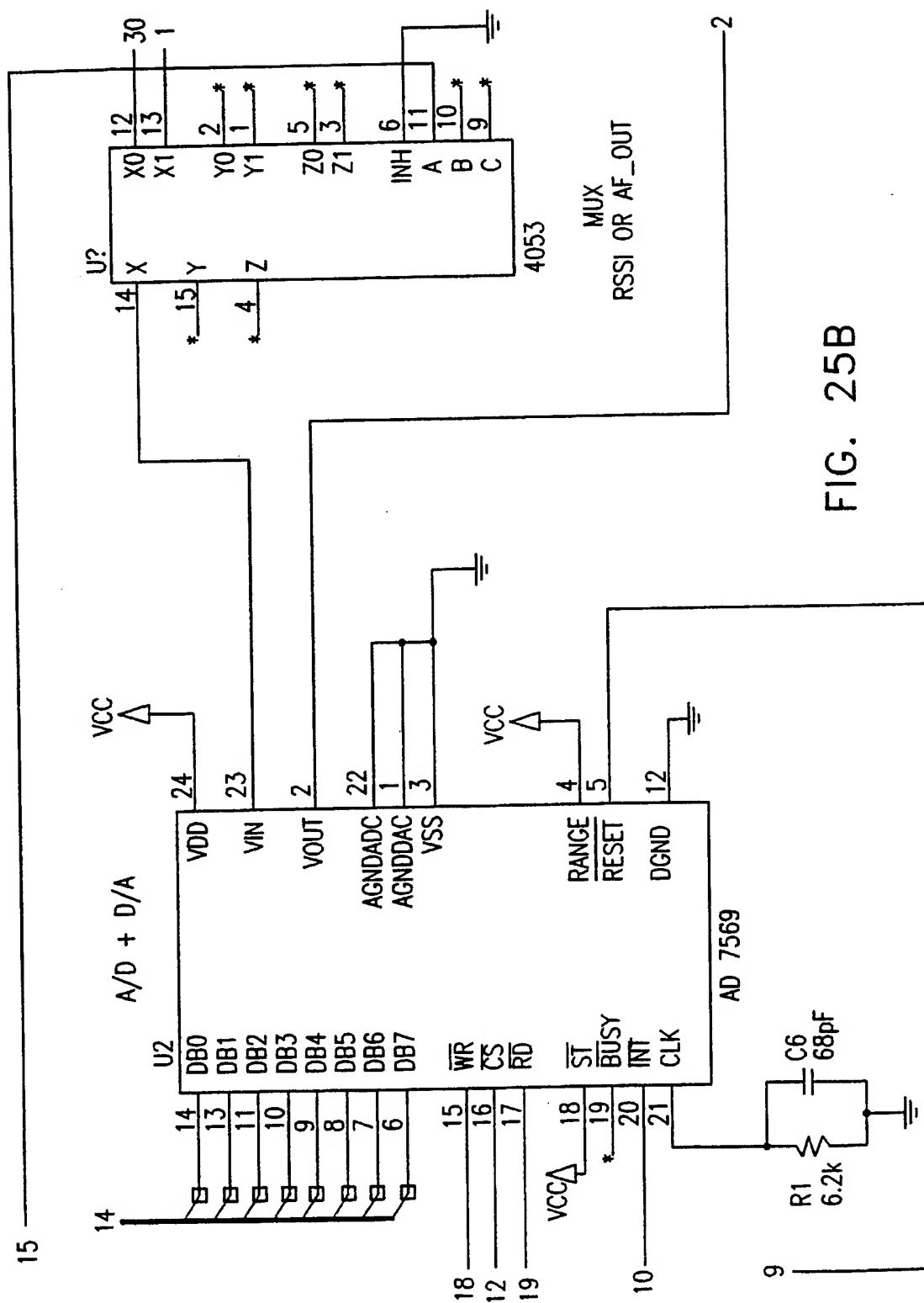
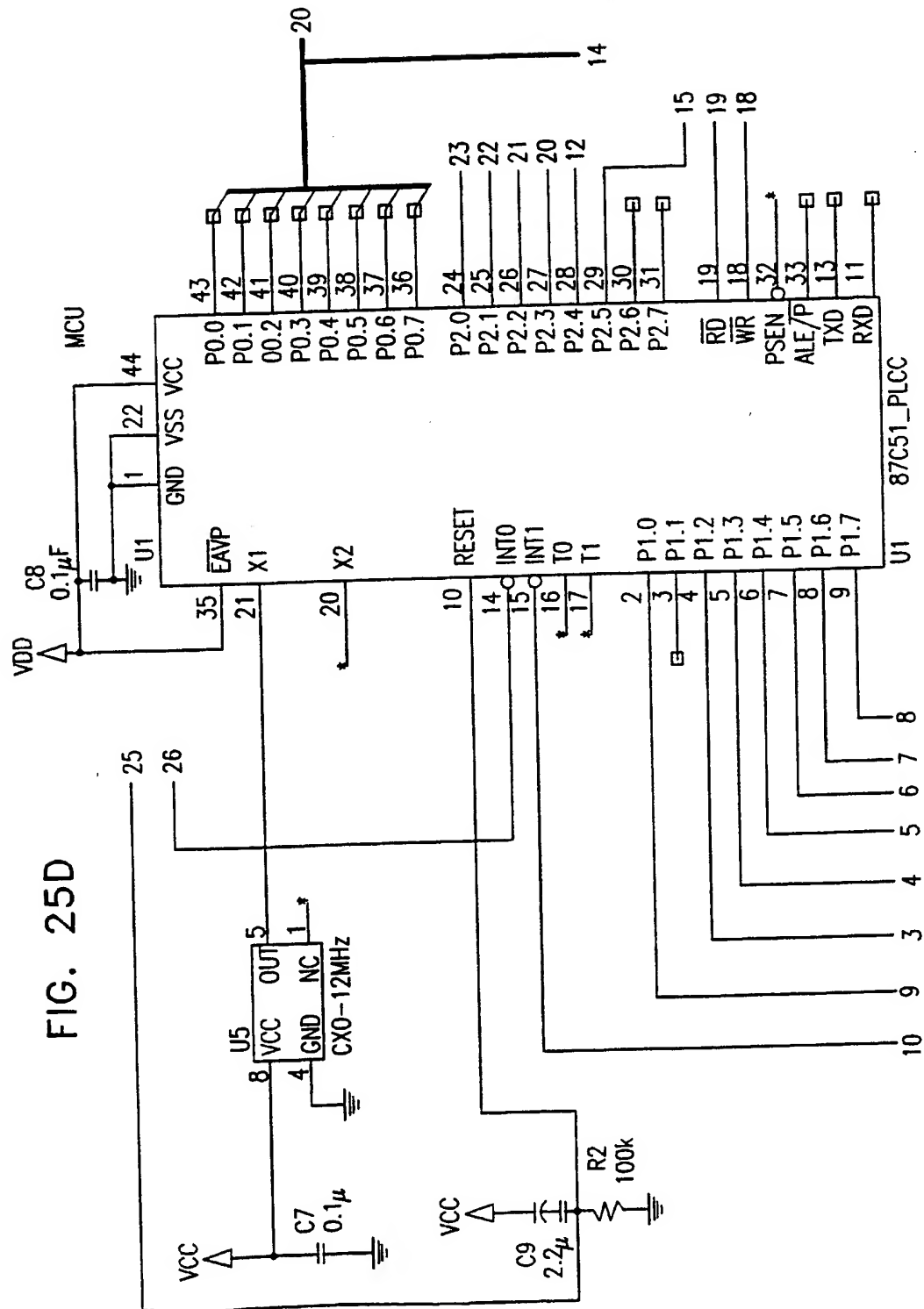


FIG. 25B



84/192



85/192

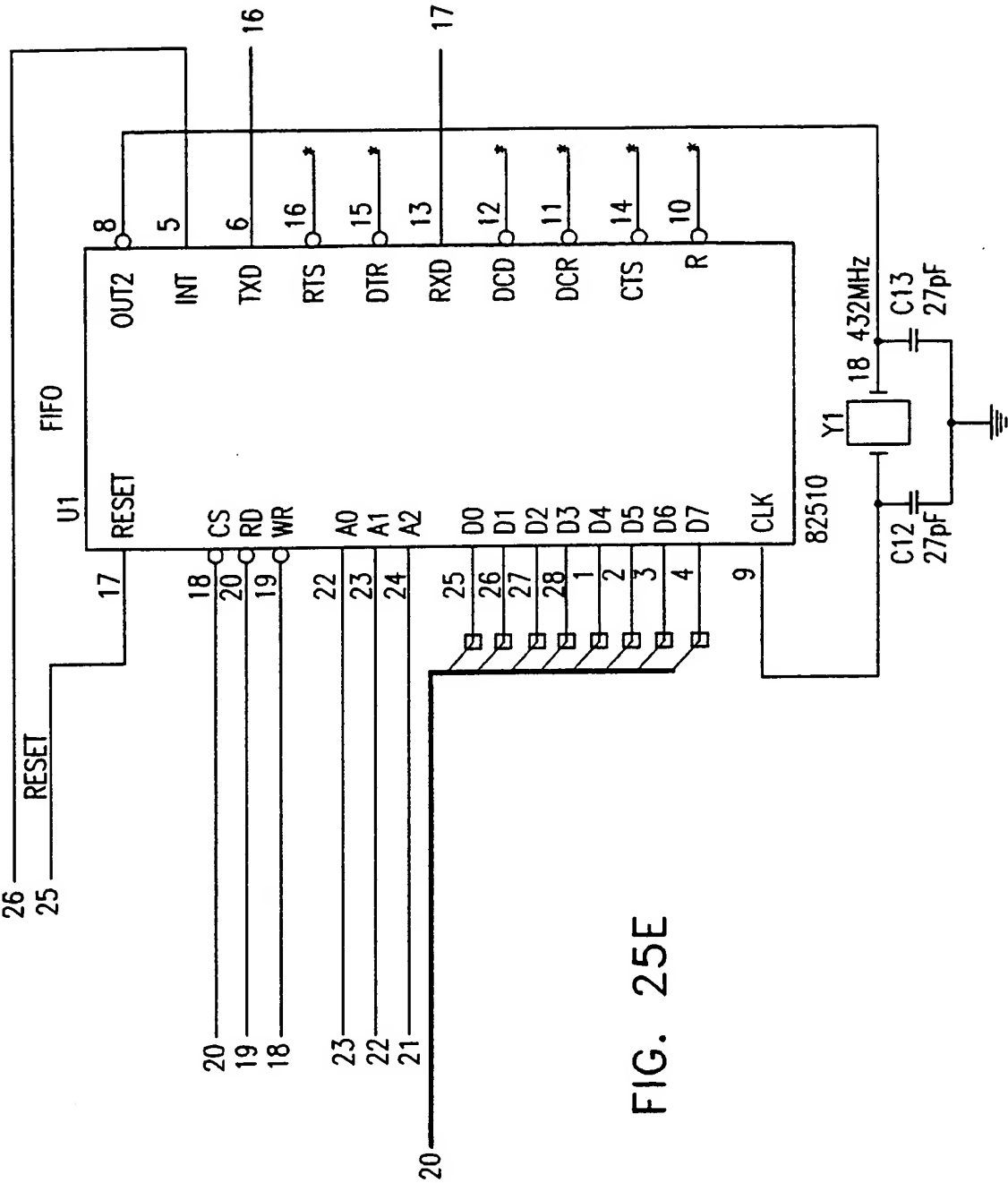


FIG. 25E

86/192

FIG. 26A

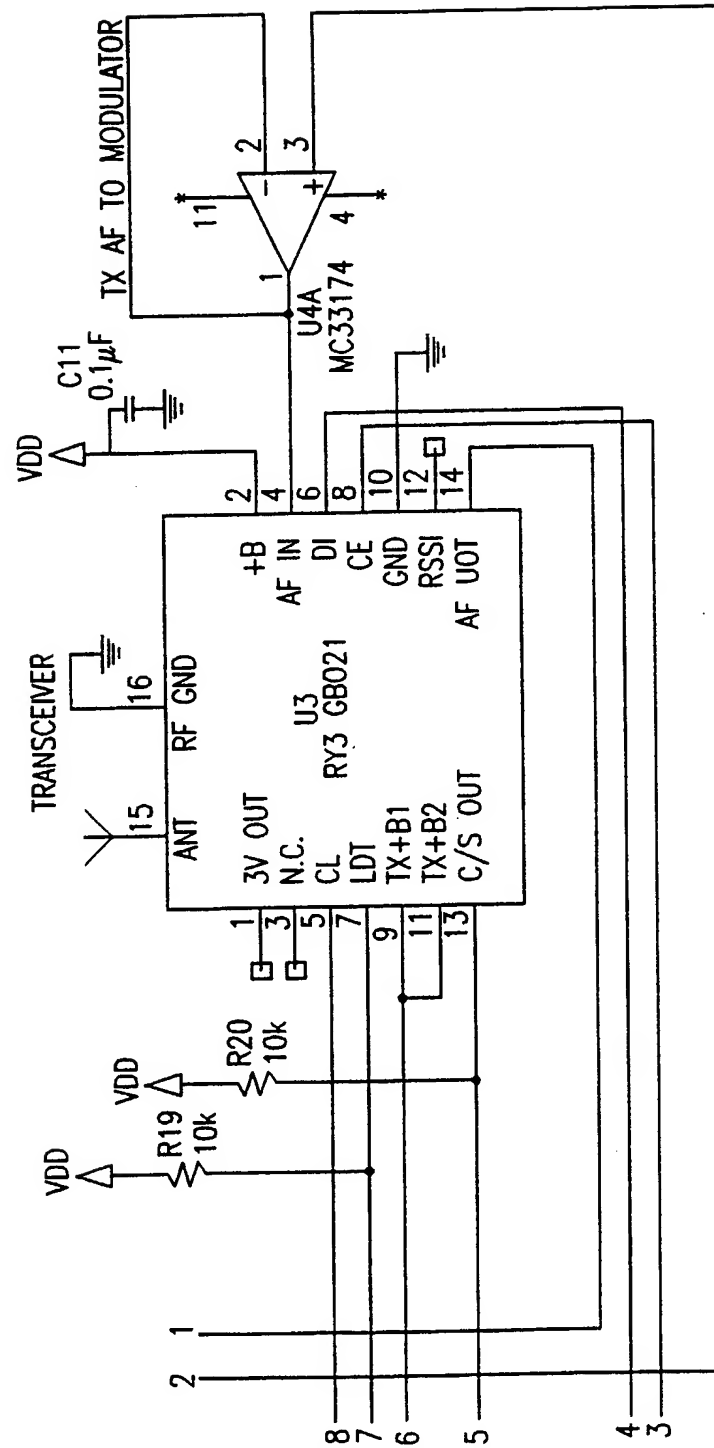




FIG. 26B

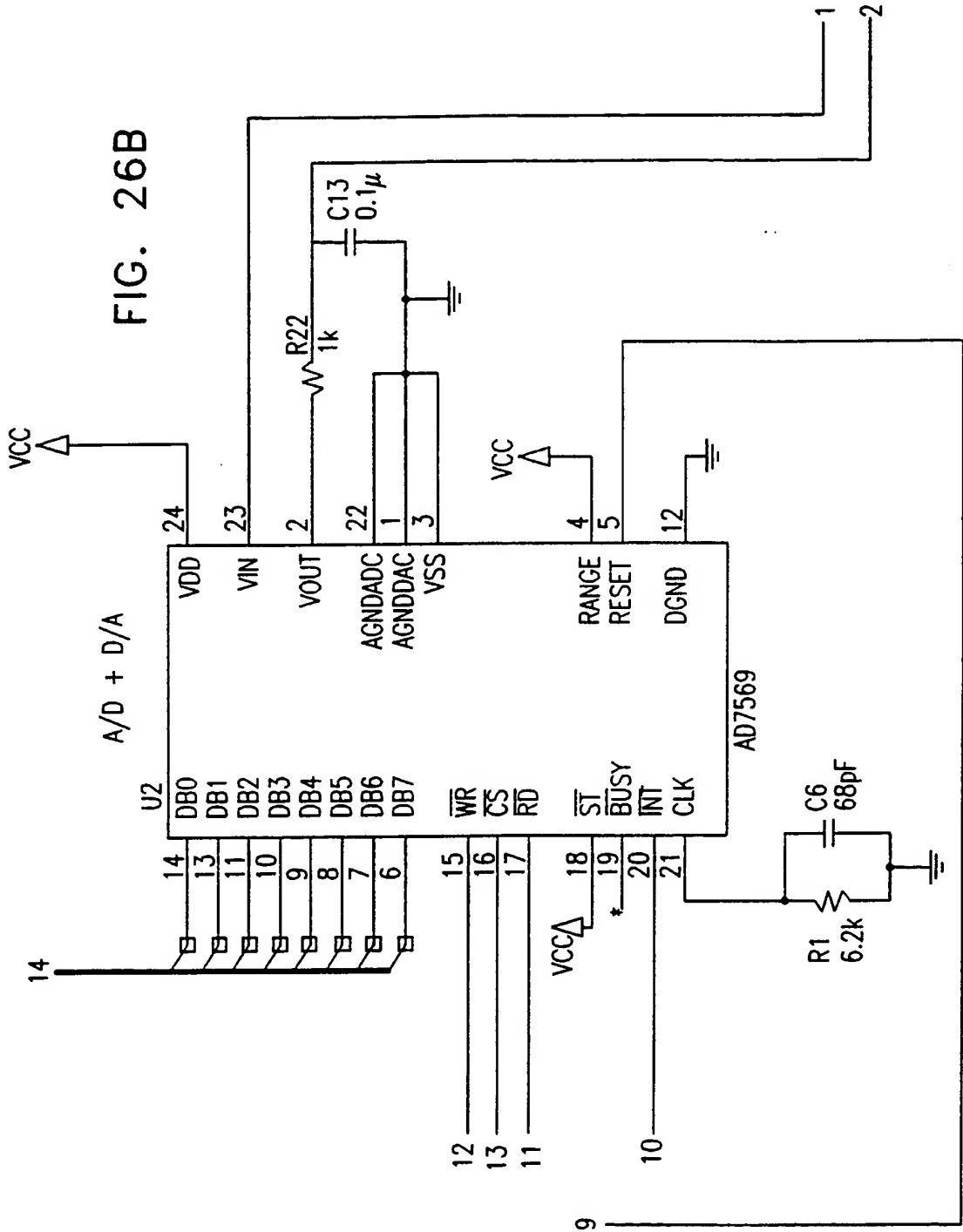
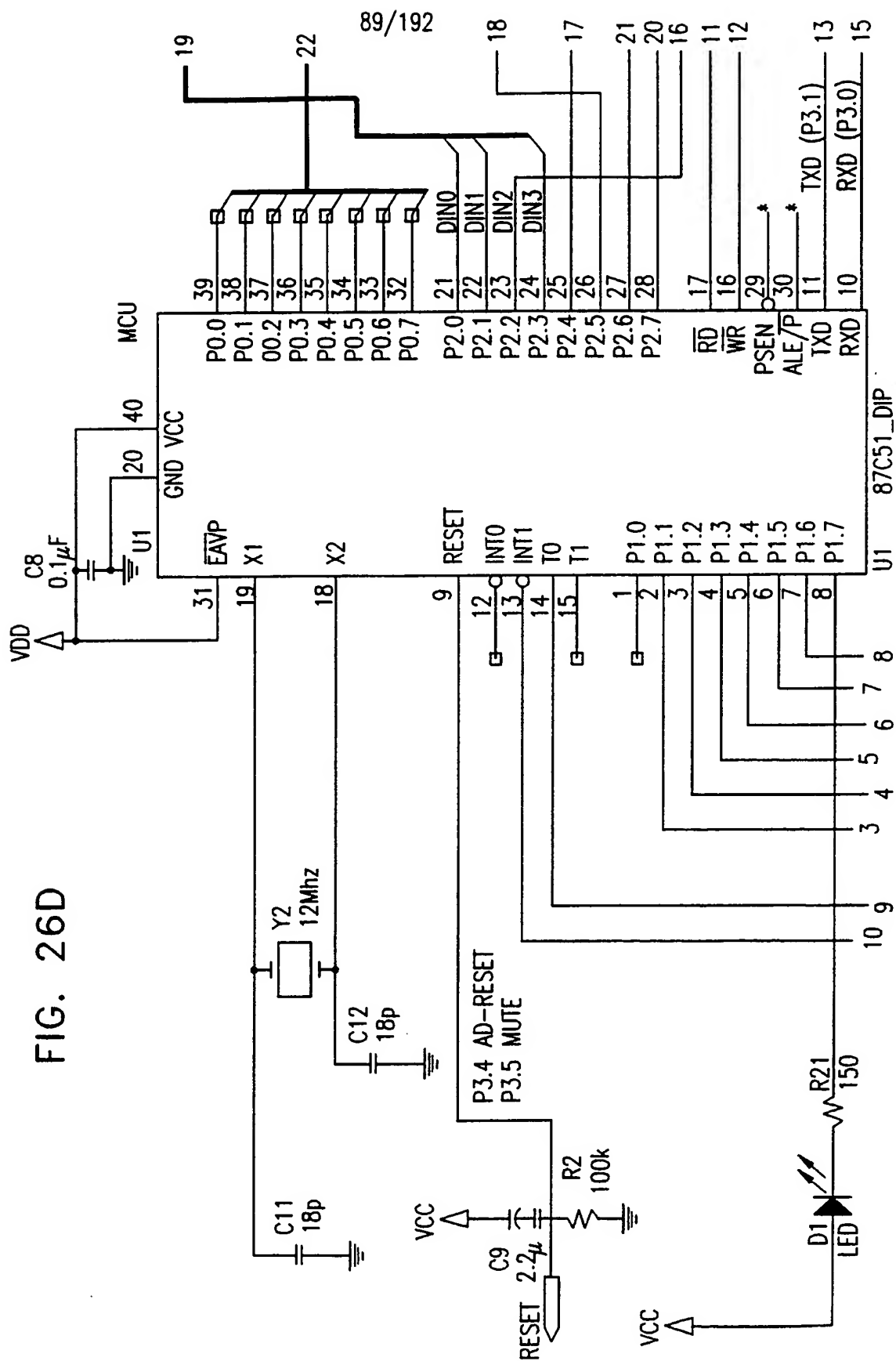


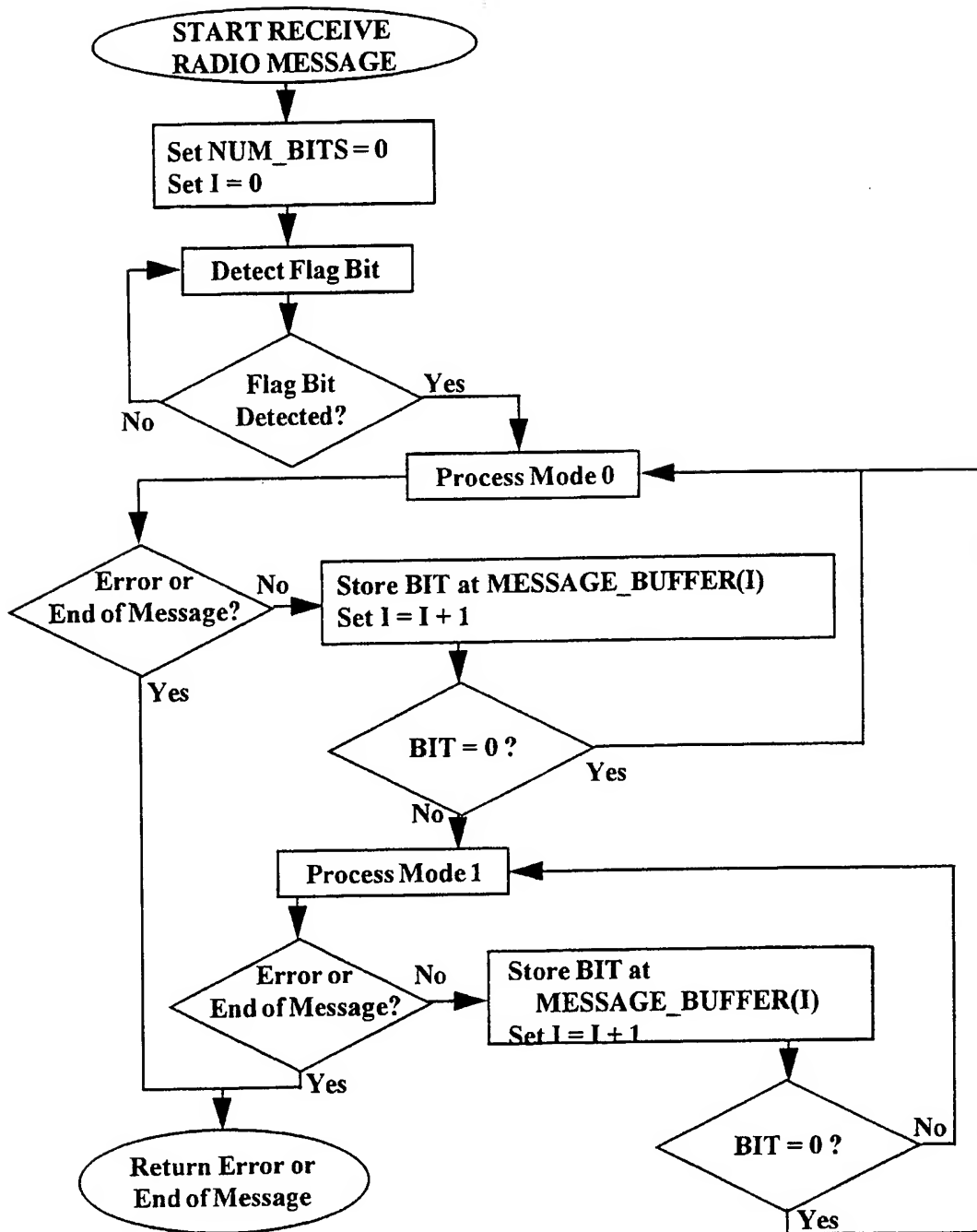


FIG. 26D



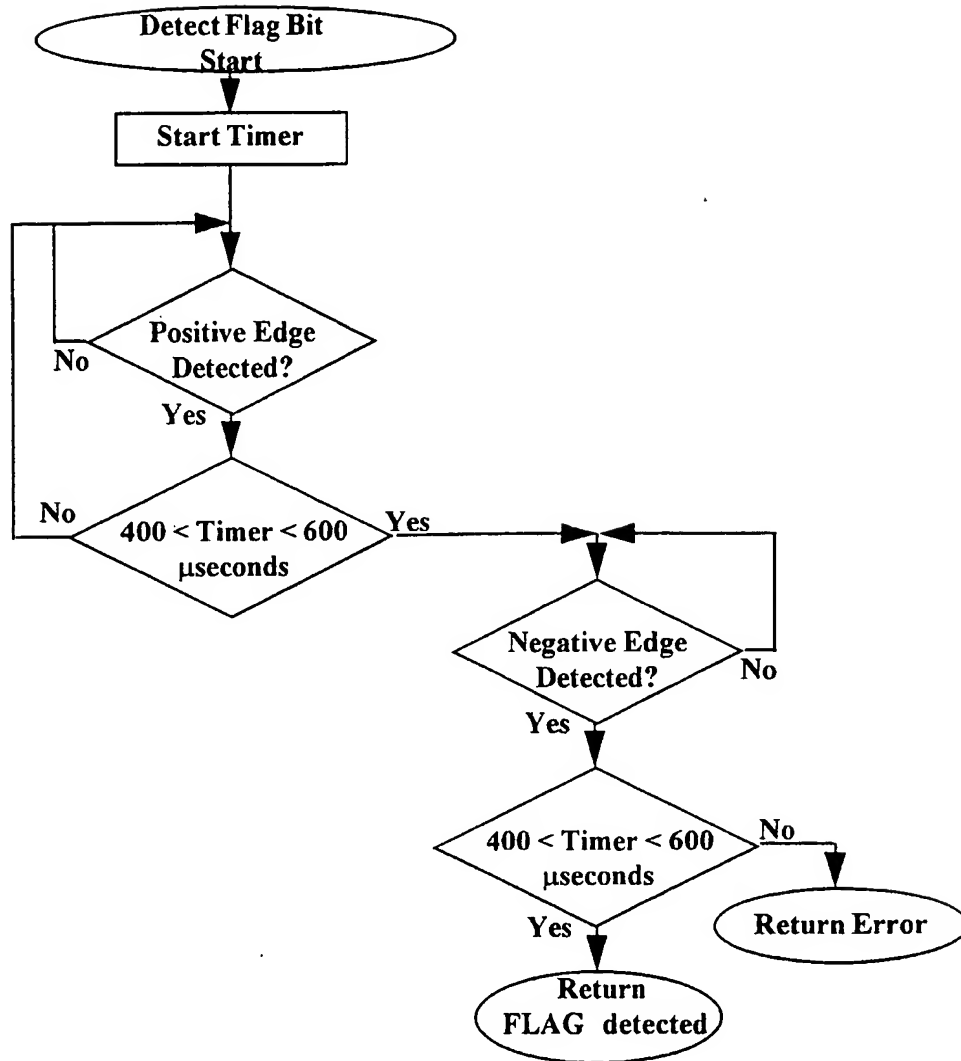
90/192

FIGURE 27A



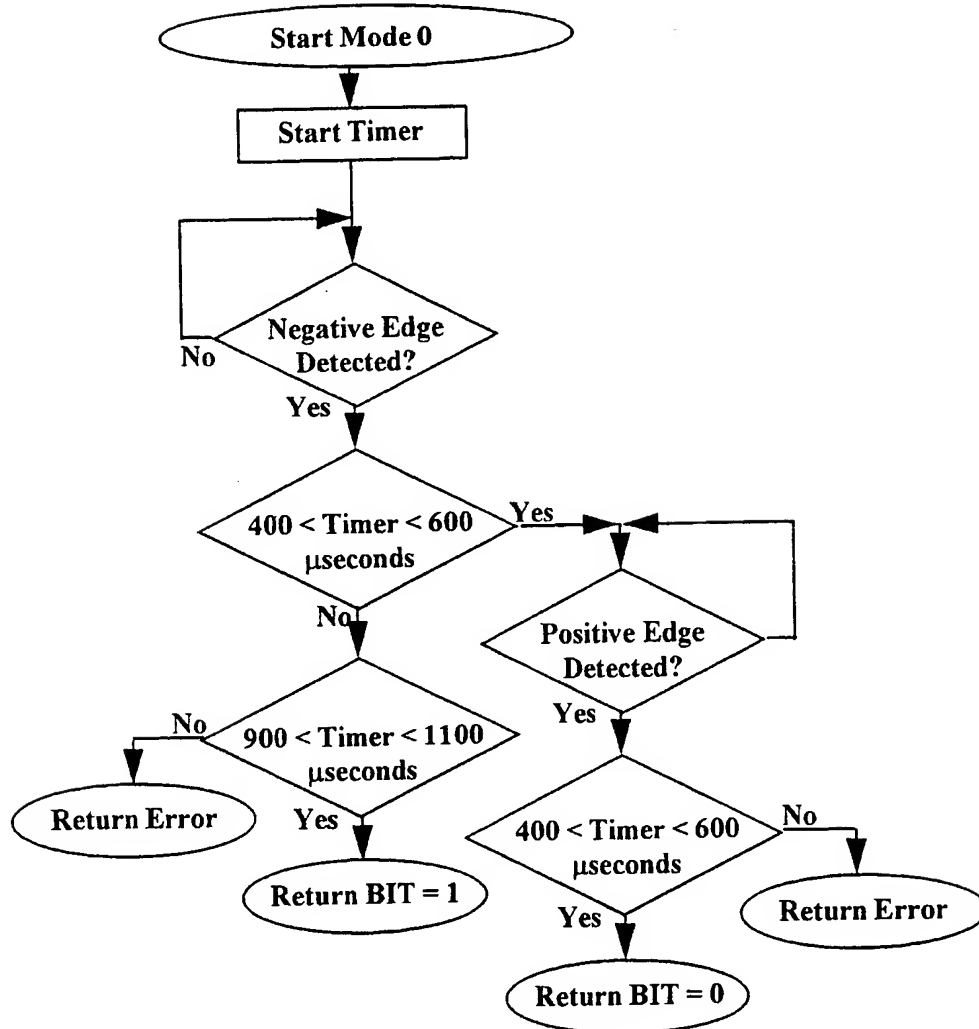
91/192

FIGURE 27B



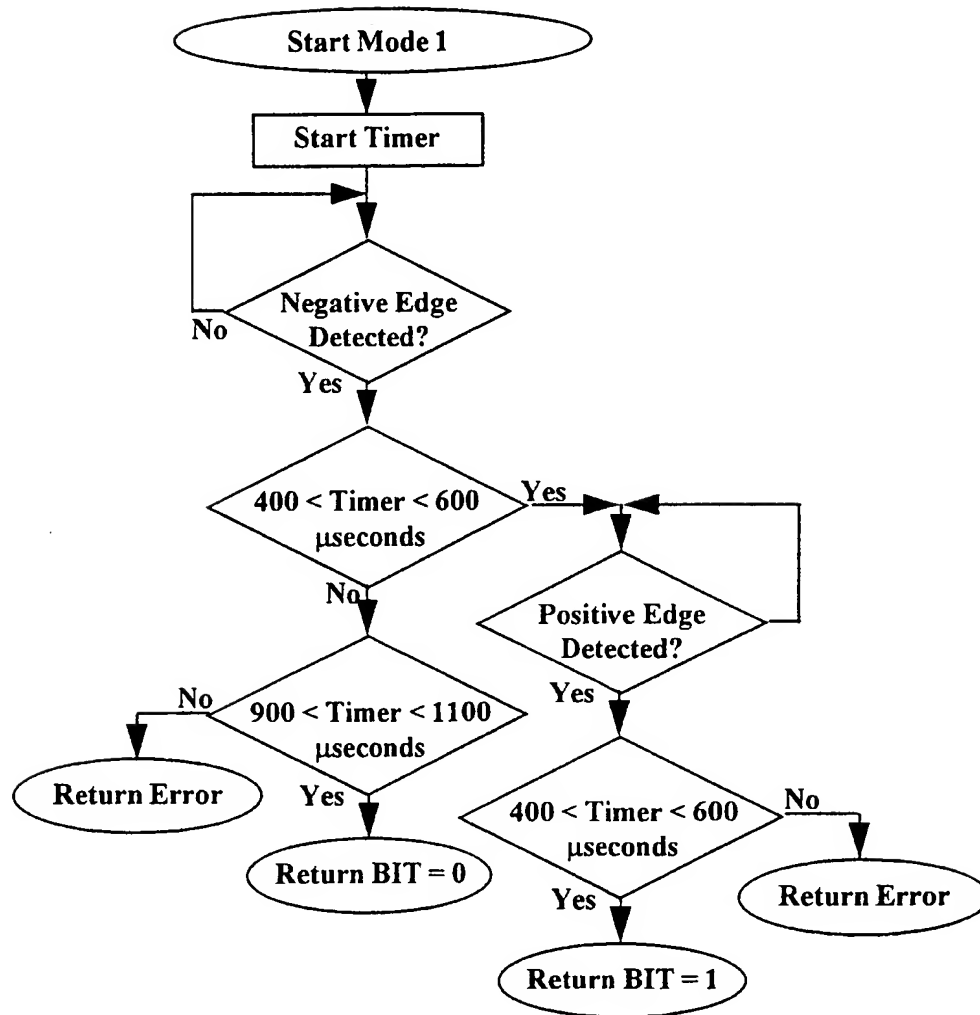
92/192

FIGURE 27C



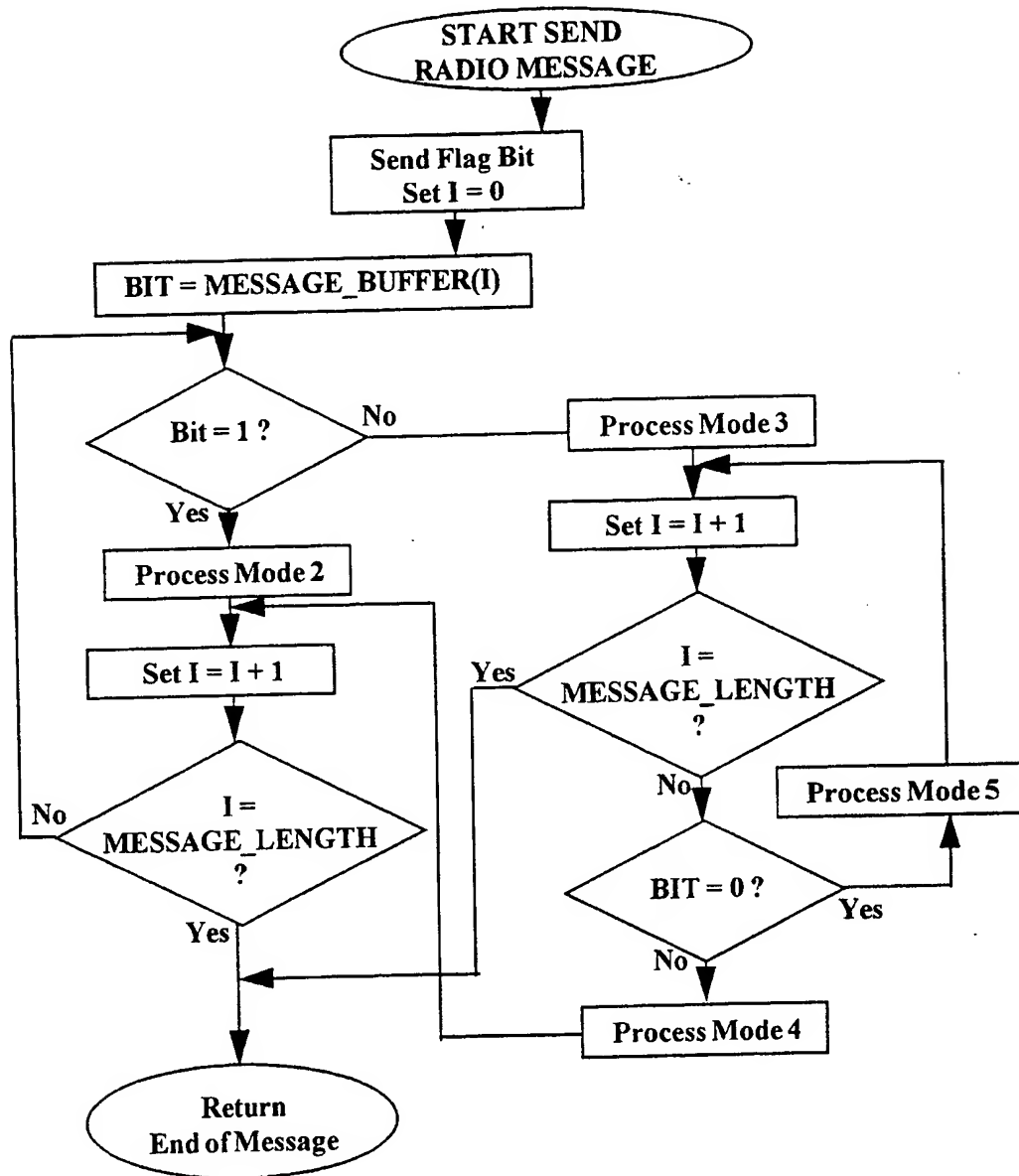
93/192

FIGURE 27D



94/192

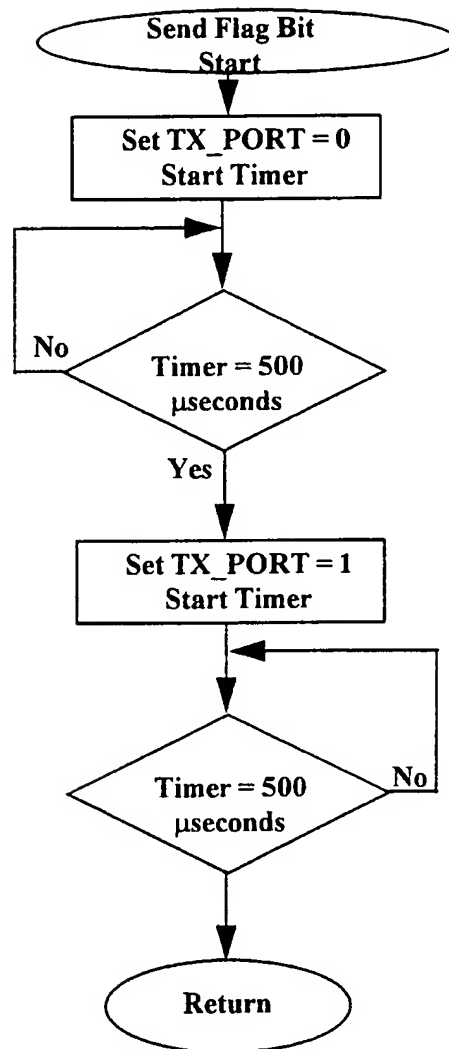
FIGURE 27E





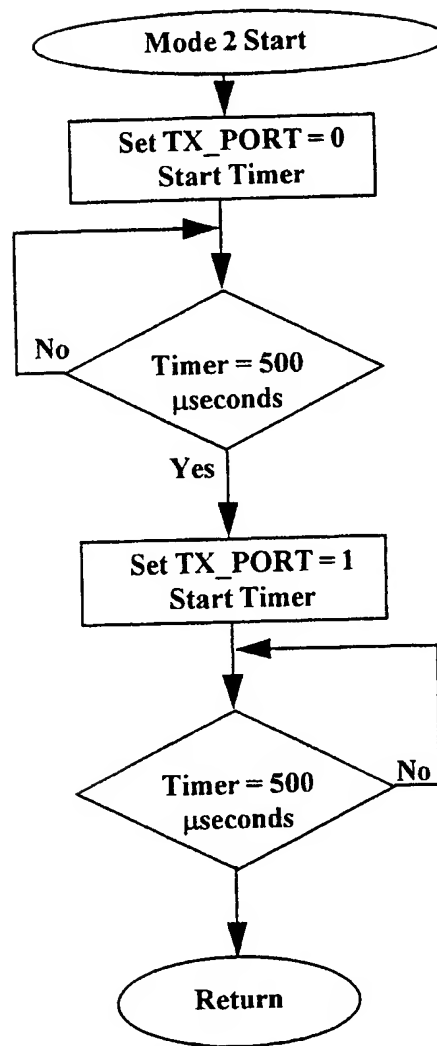
95/192

FIGURE 27F



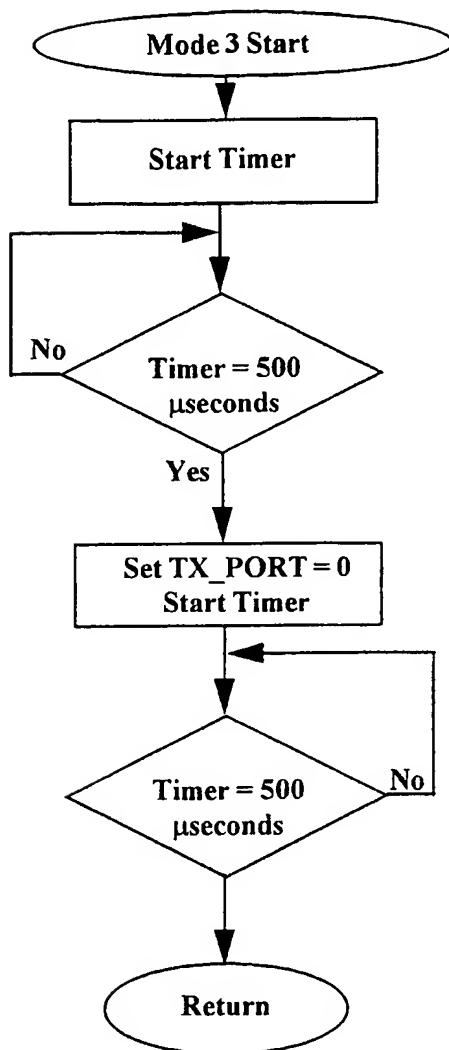
96/192

FIGURE 27G



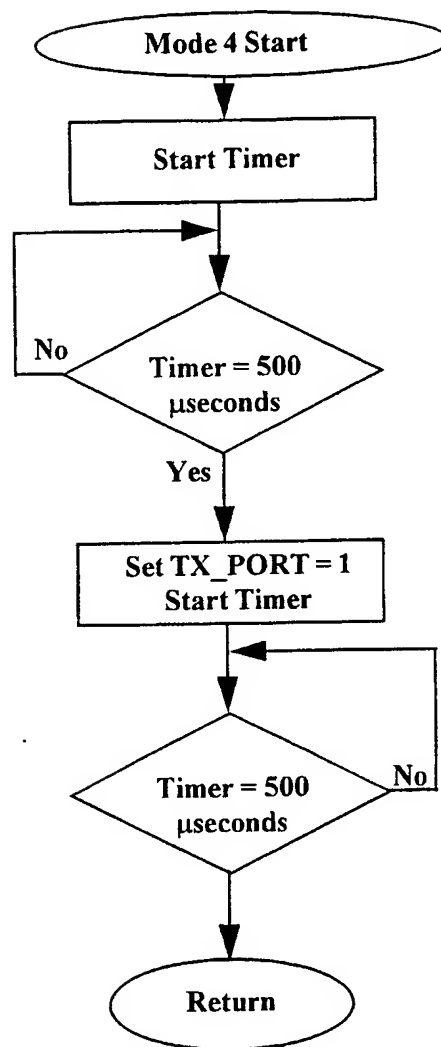
97/192

FIGURE 27H



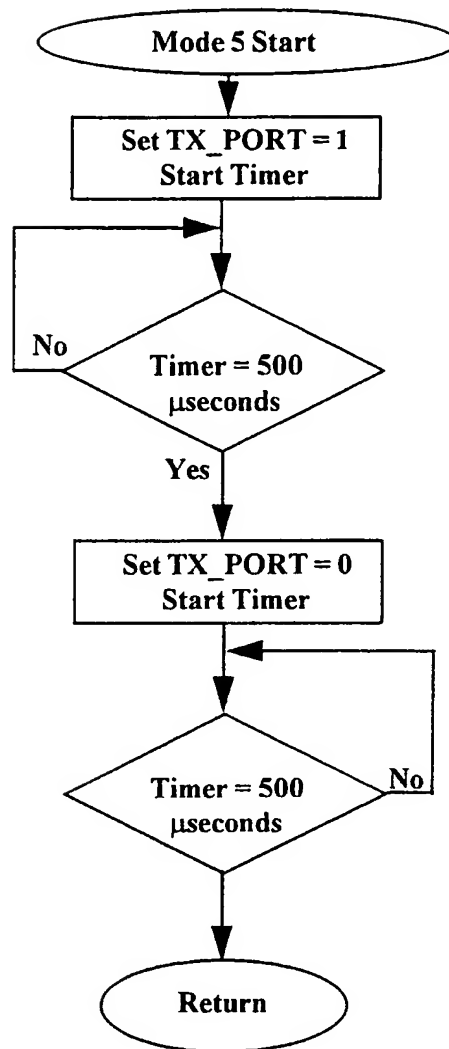
98/192

FIGURE 27I



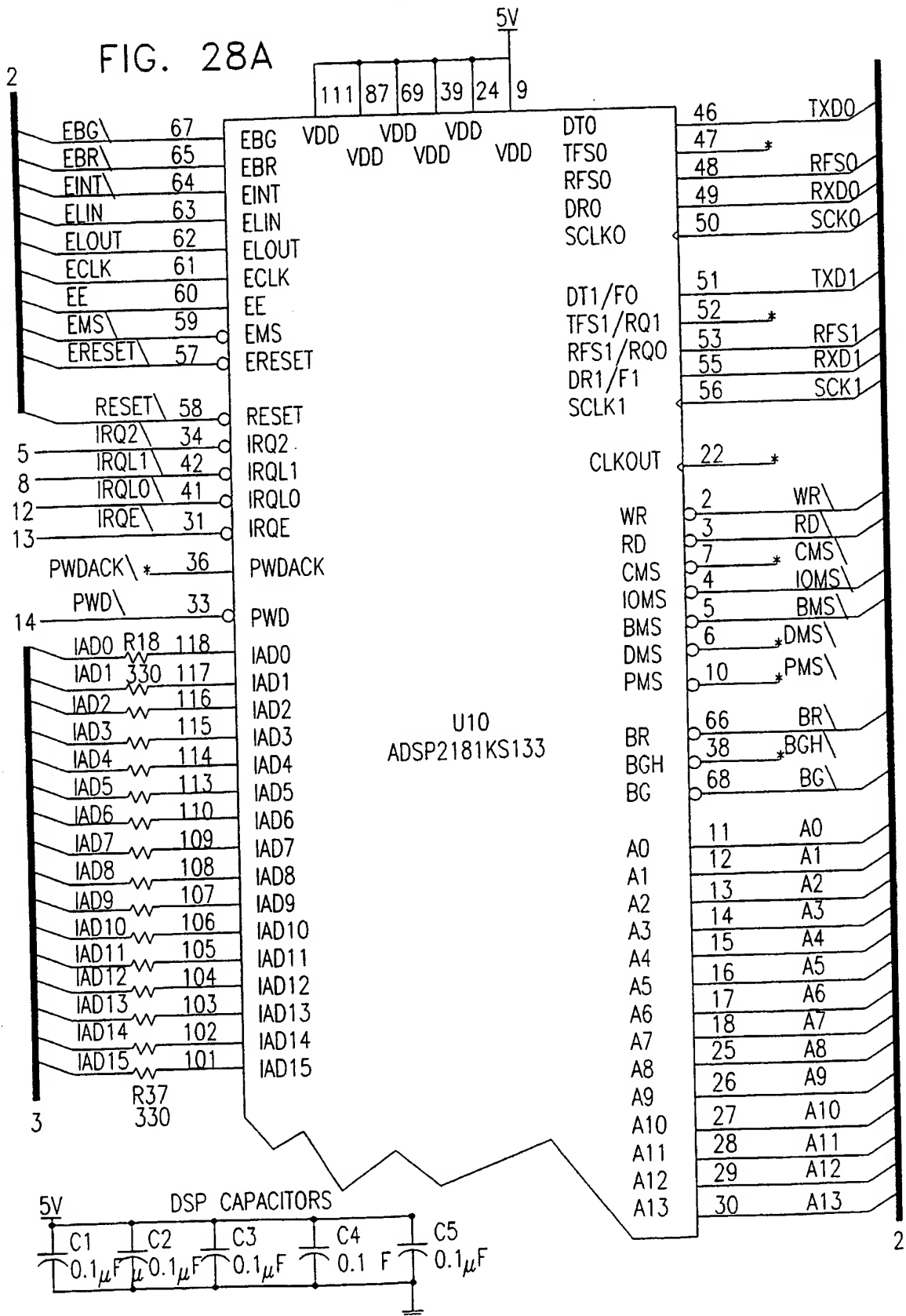
99/192

FIGURE 27J



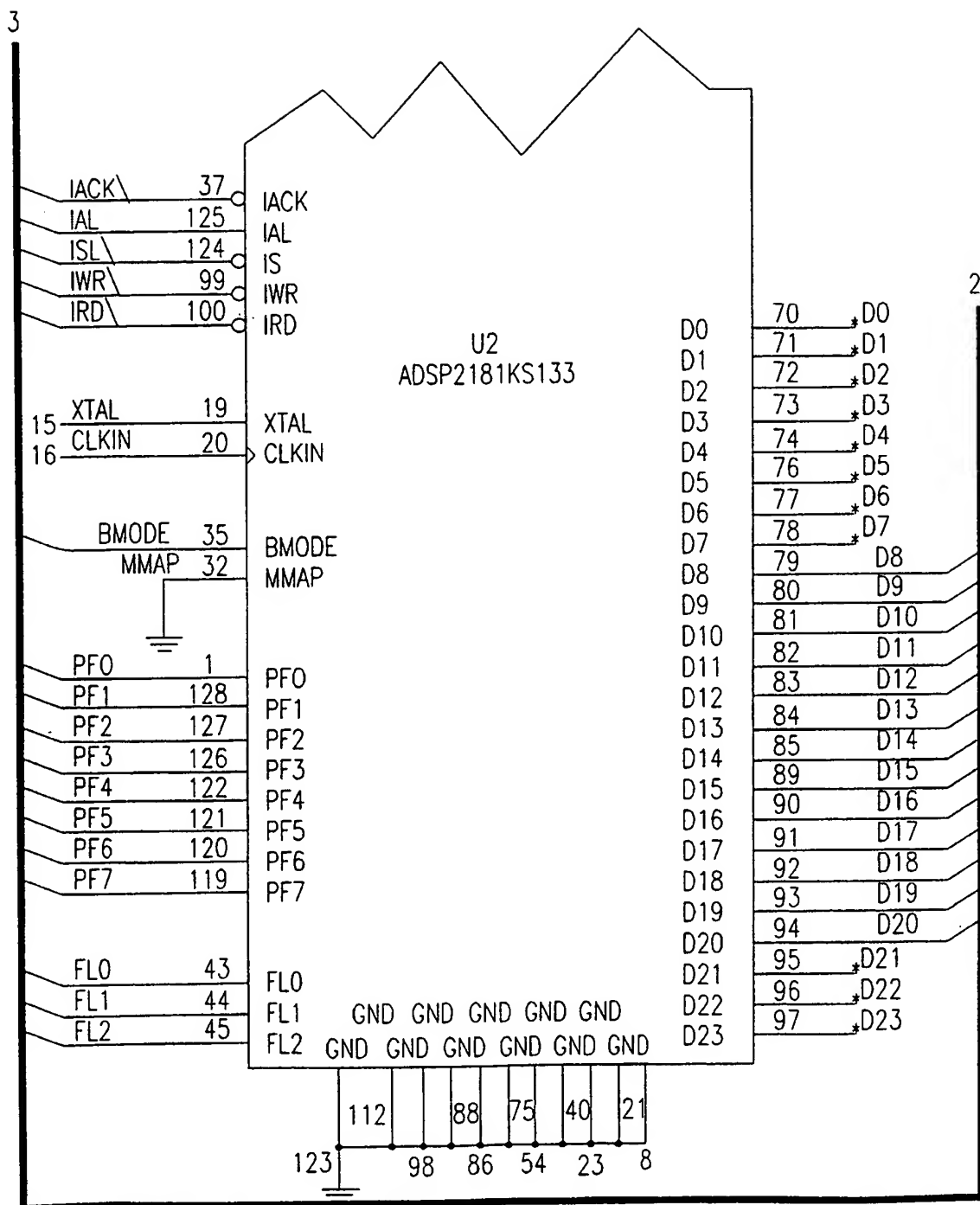
100/192

FIG. 28A



101/192

FIG. 28B



102/192

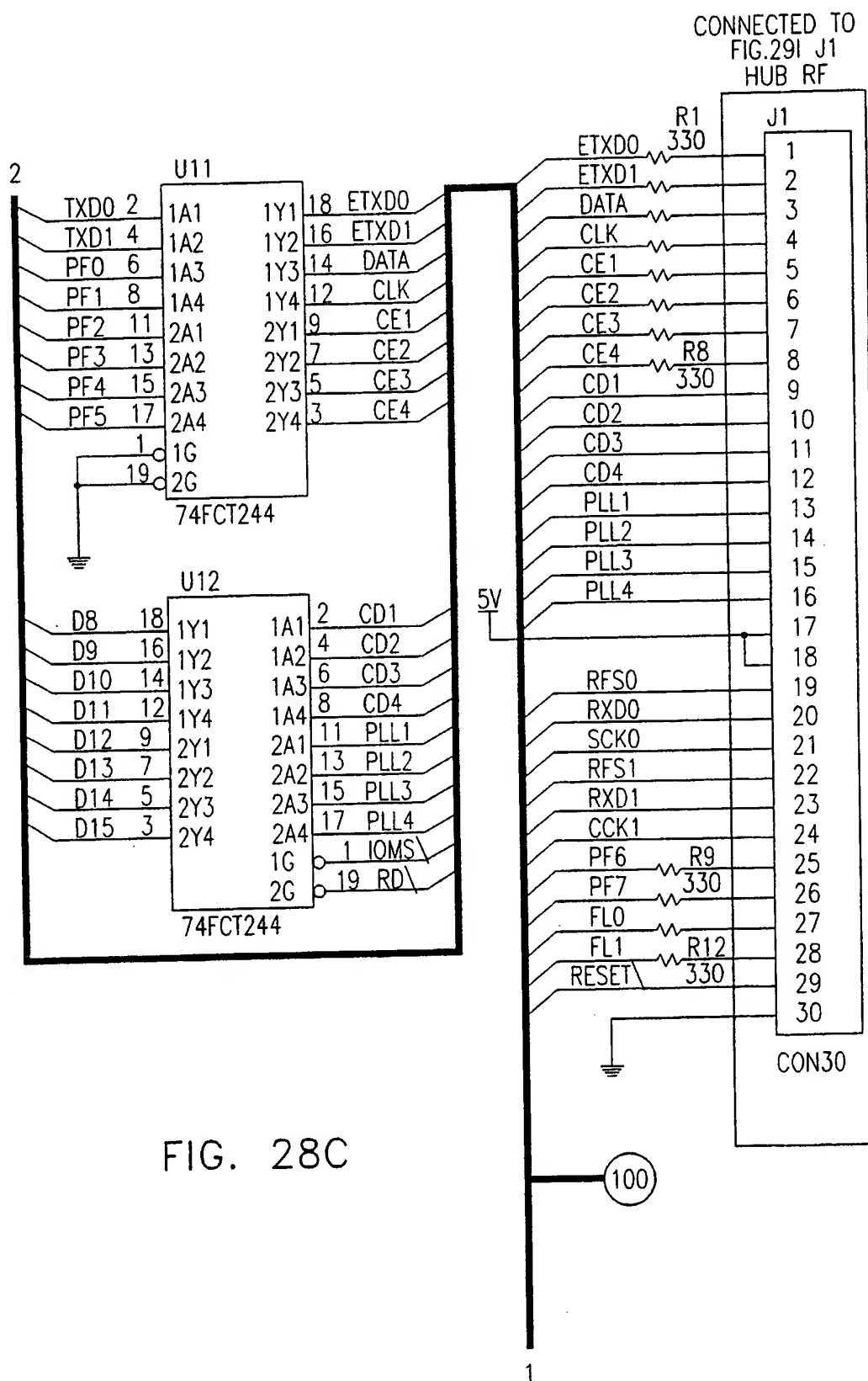
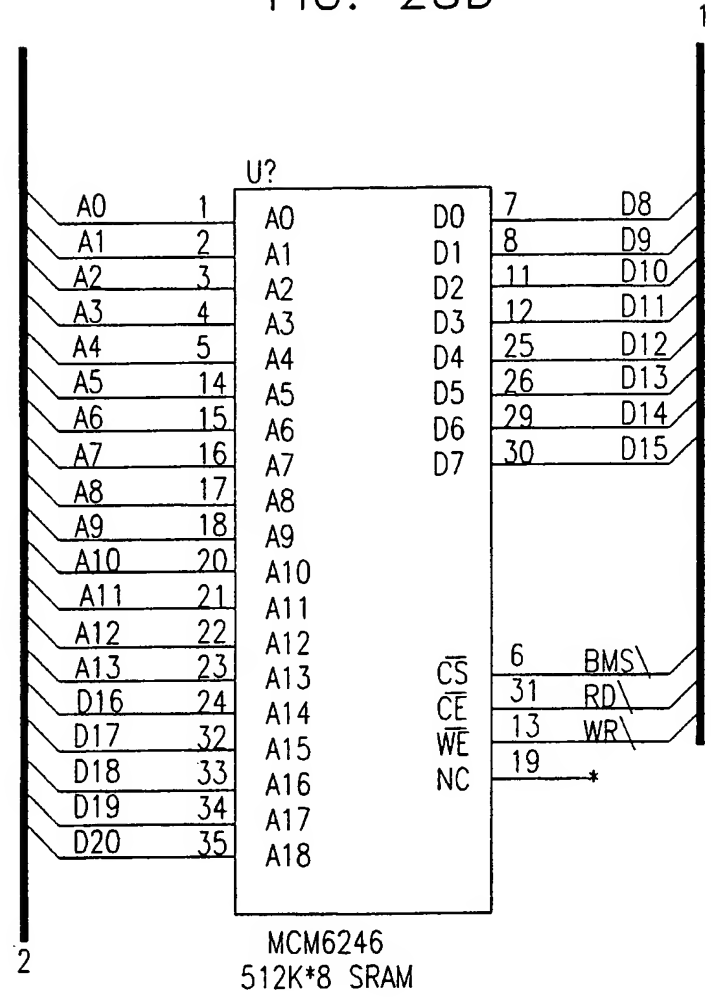


FIG. 28C



FIG. 28D



104/192

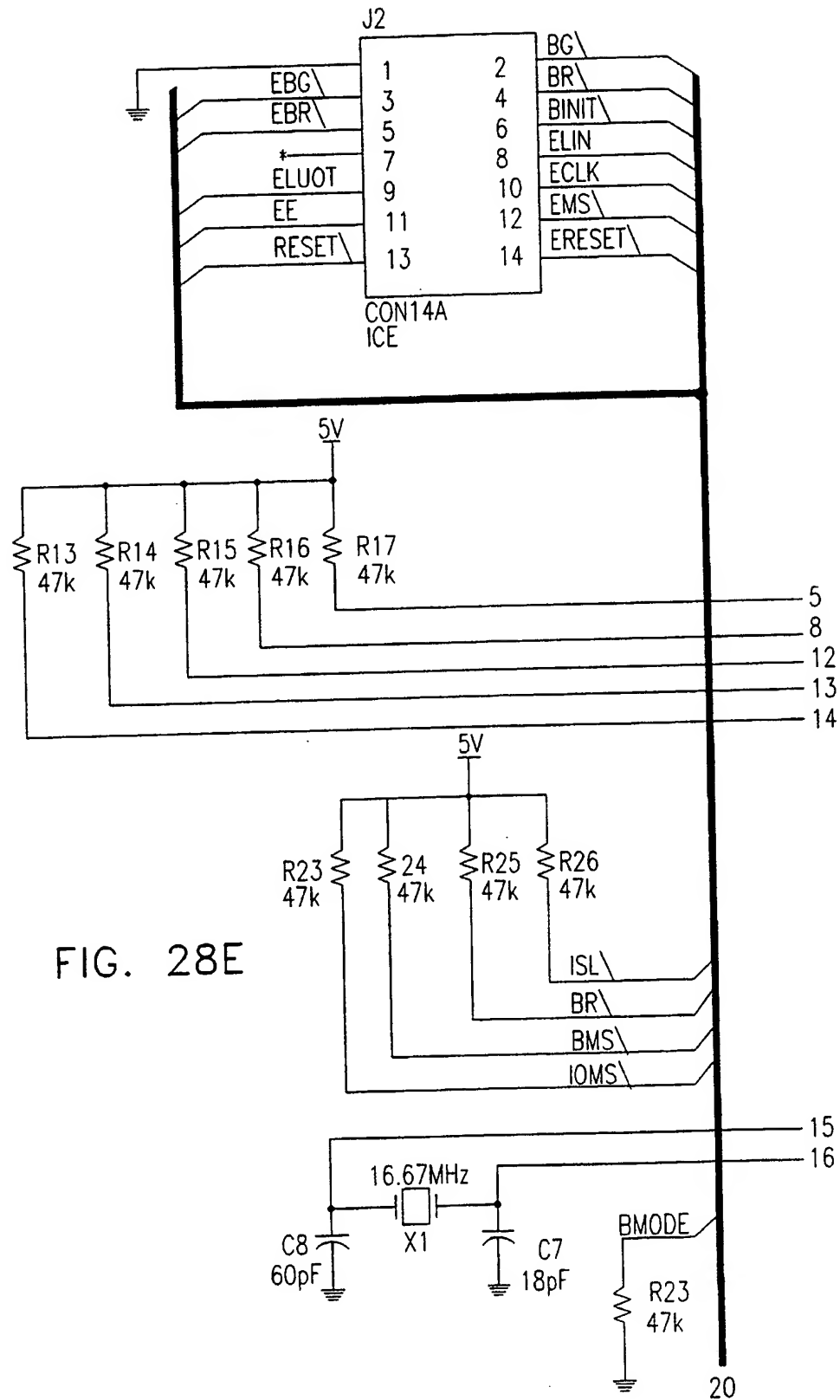
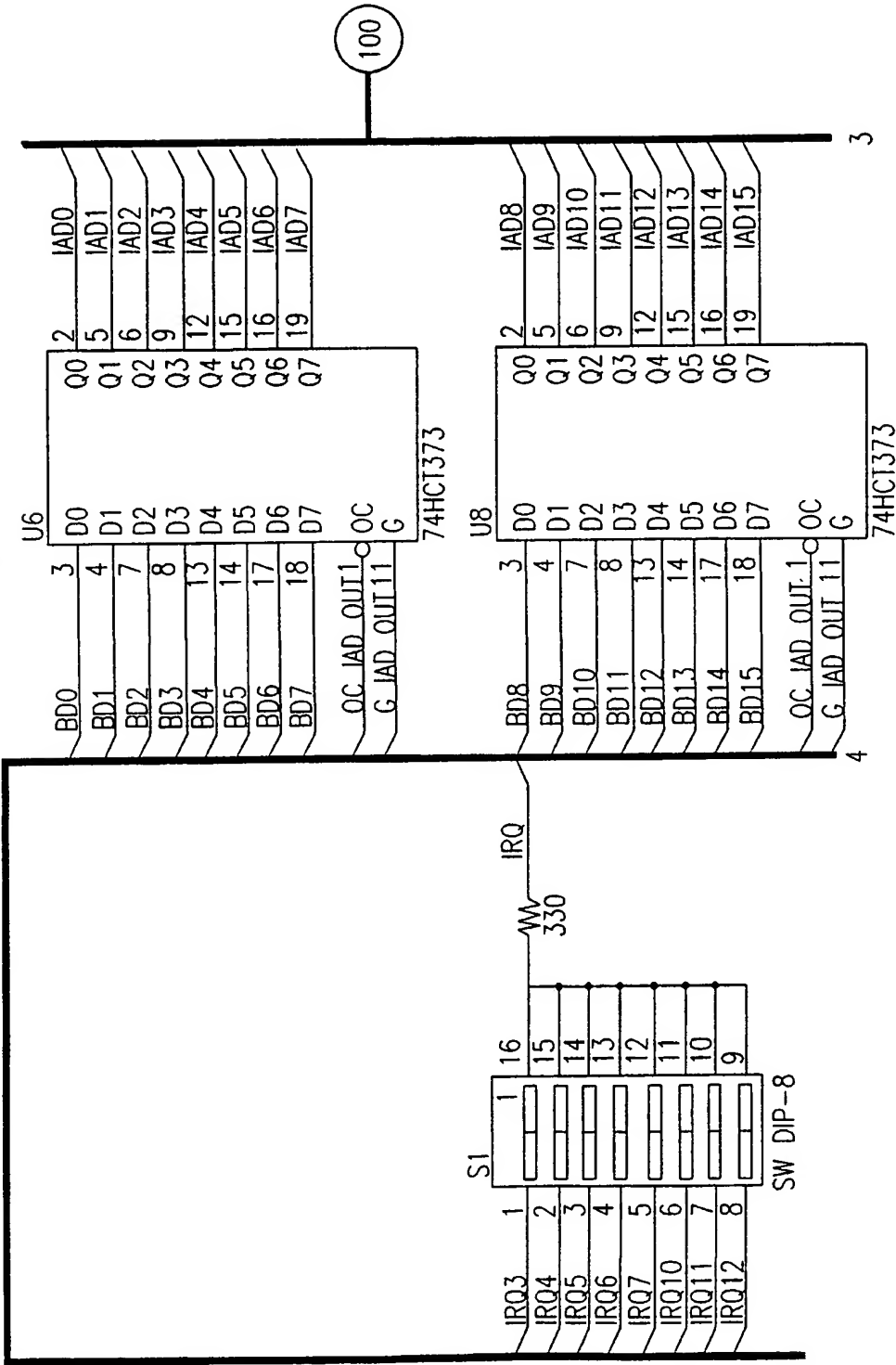


FIG. 28F



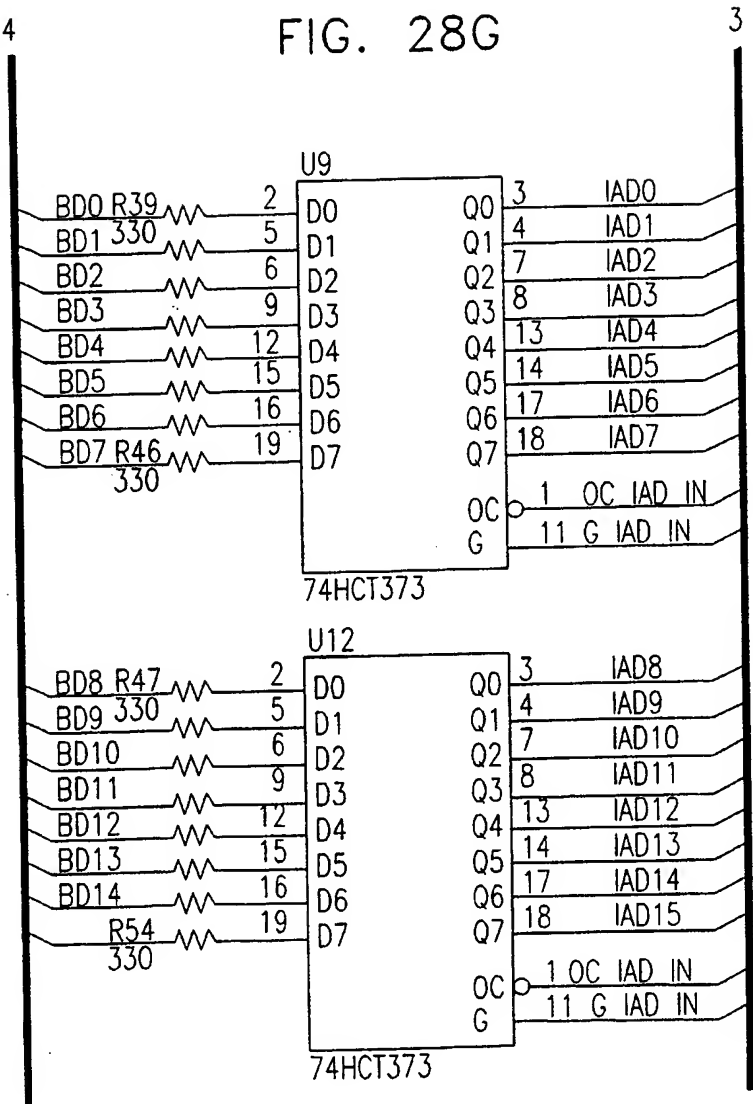
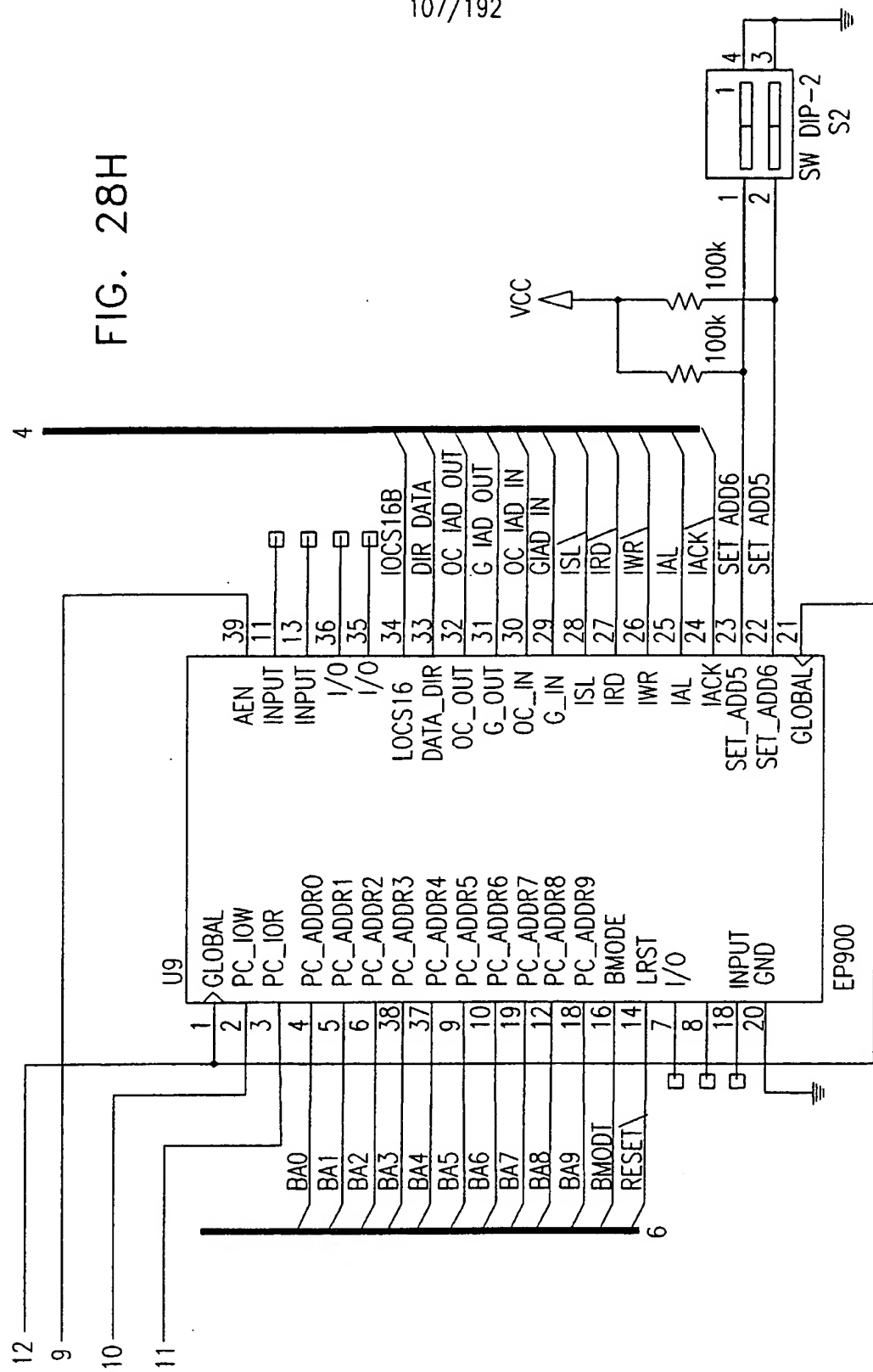
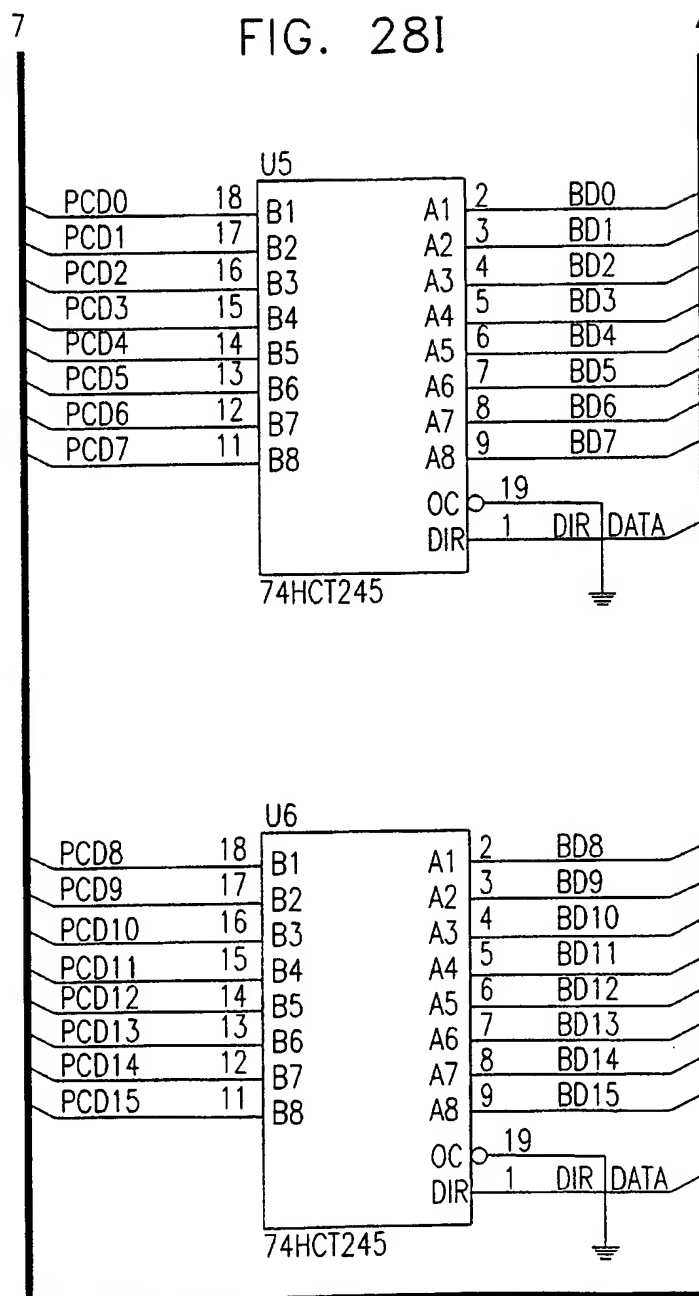


FIG. 28H



108/192



109/192

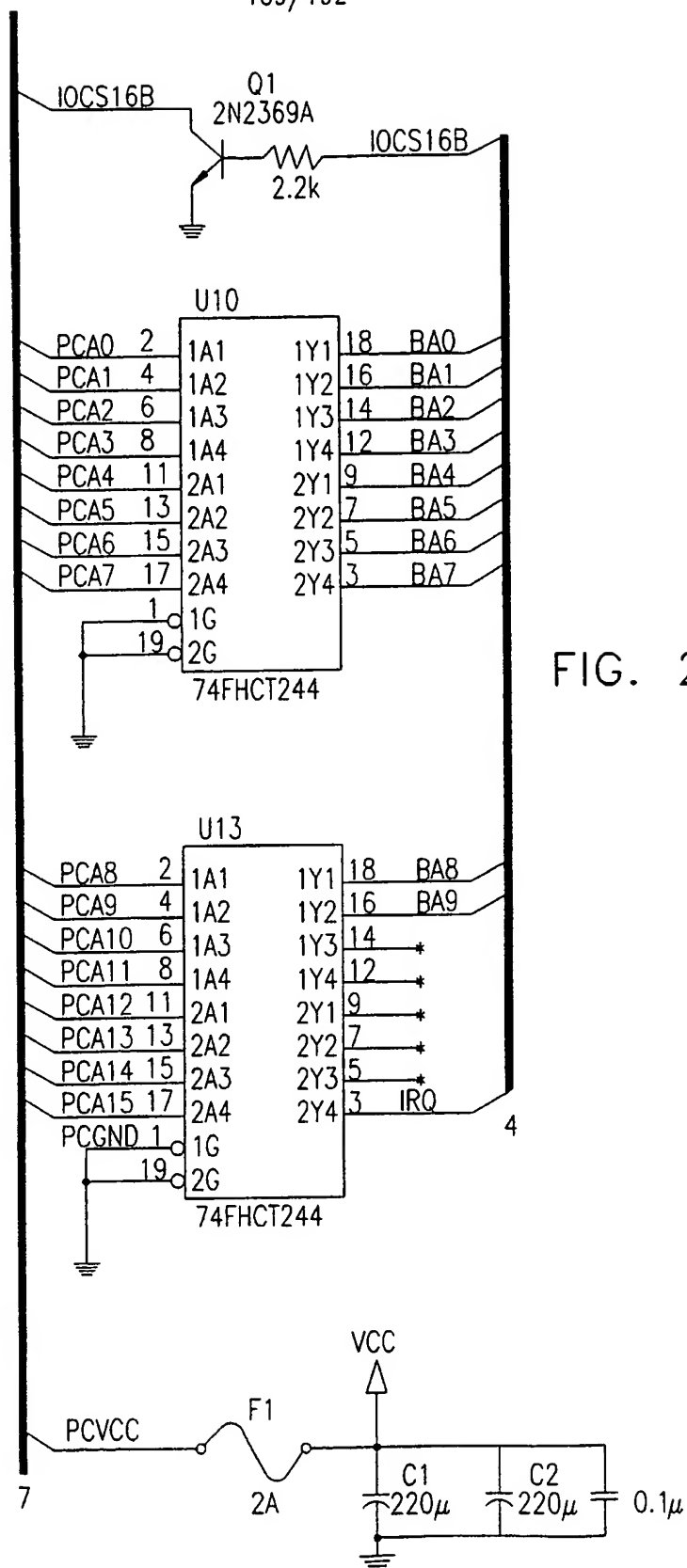
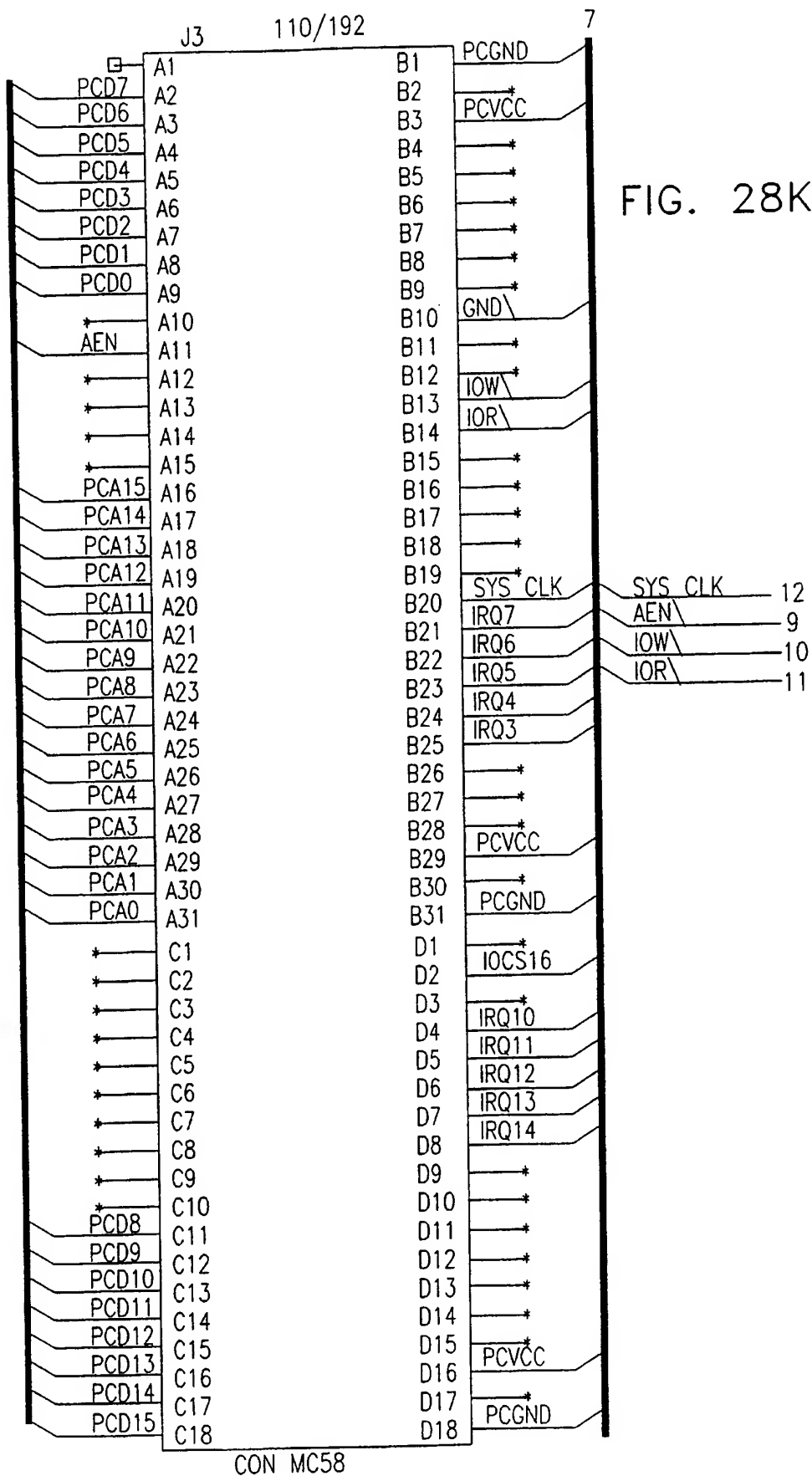
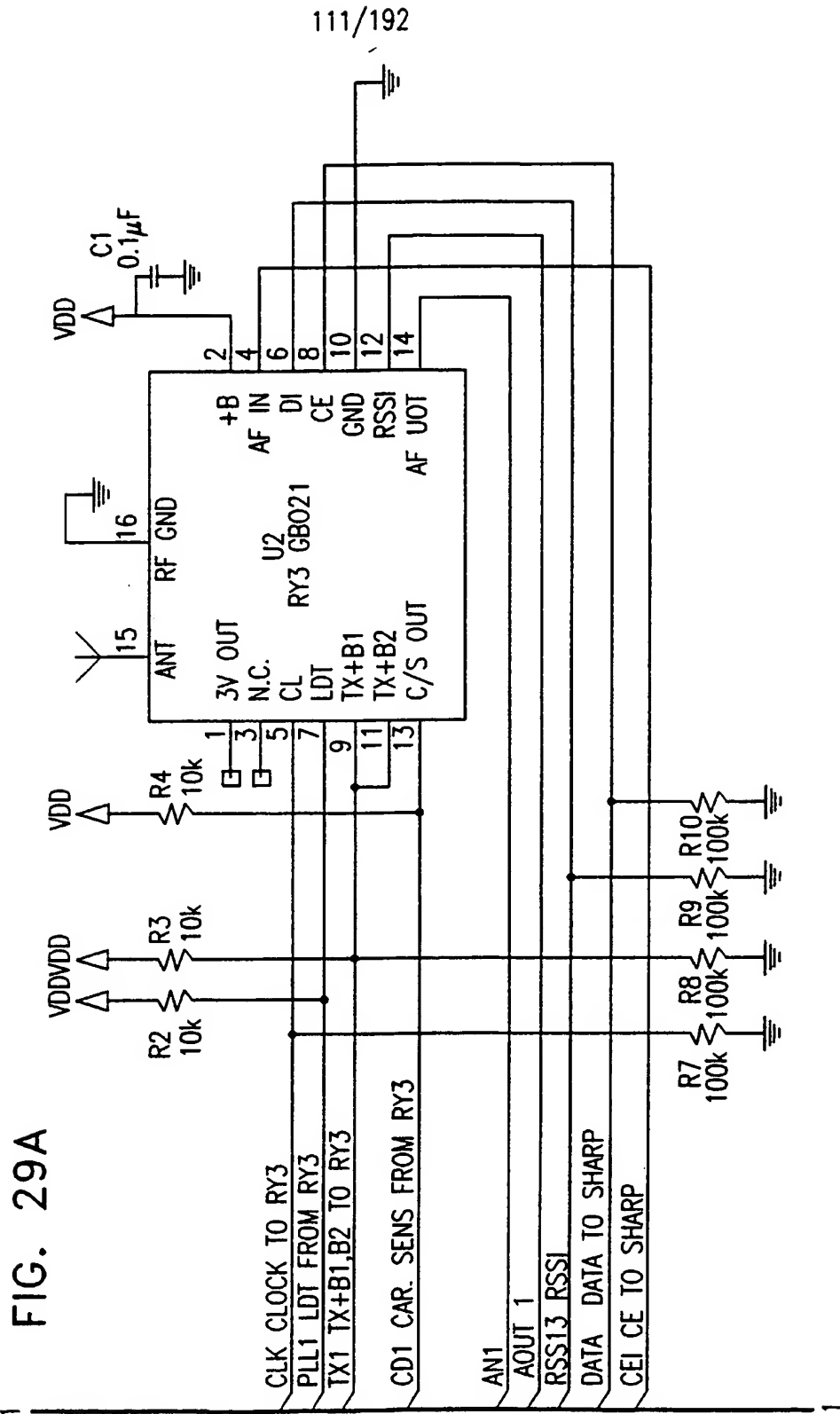


FIG. 28J







112/192

FIG. 29B

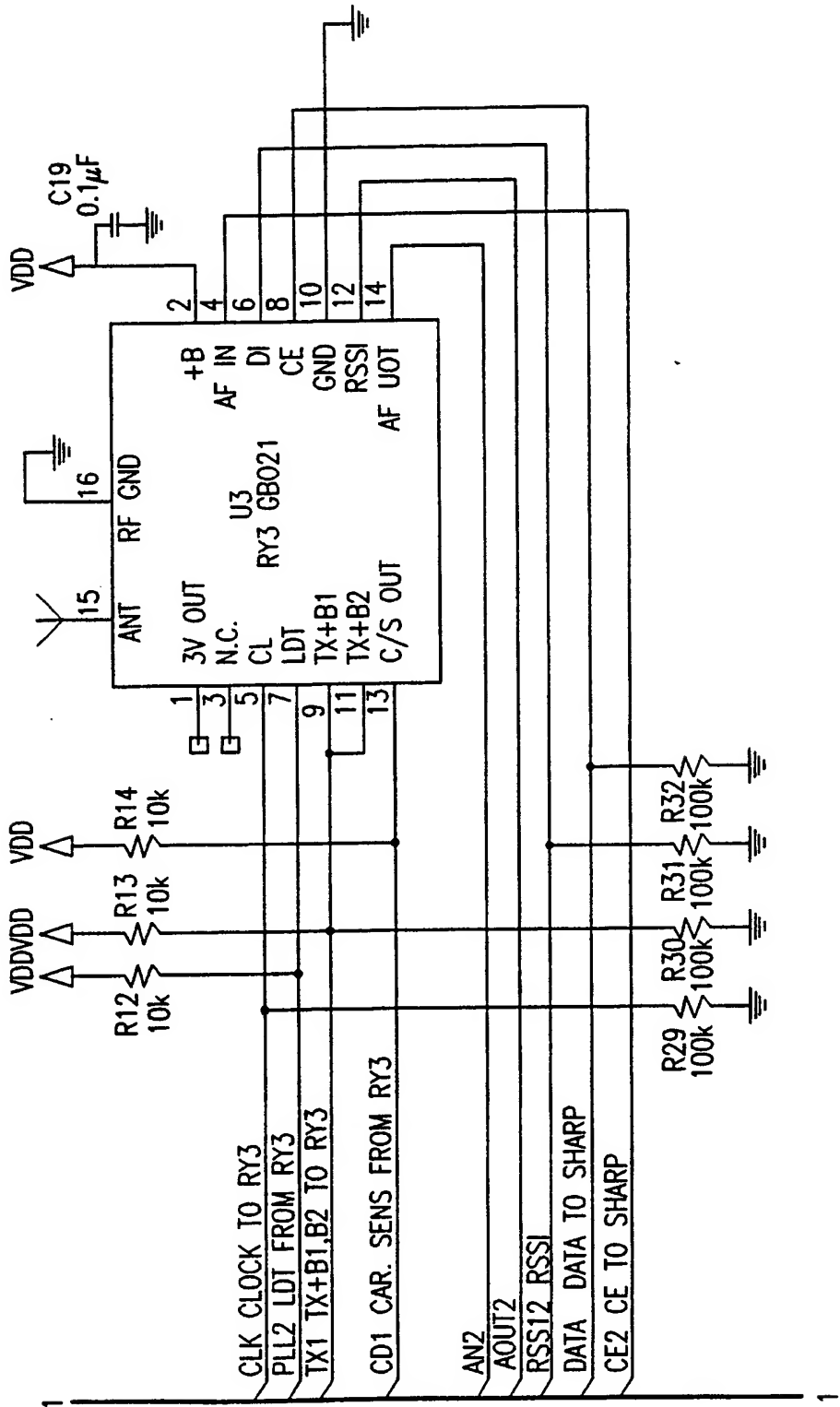


FIG. 29C

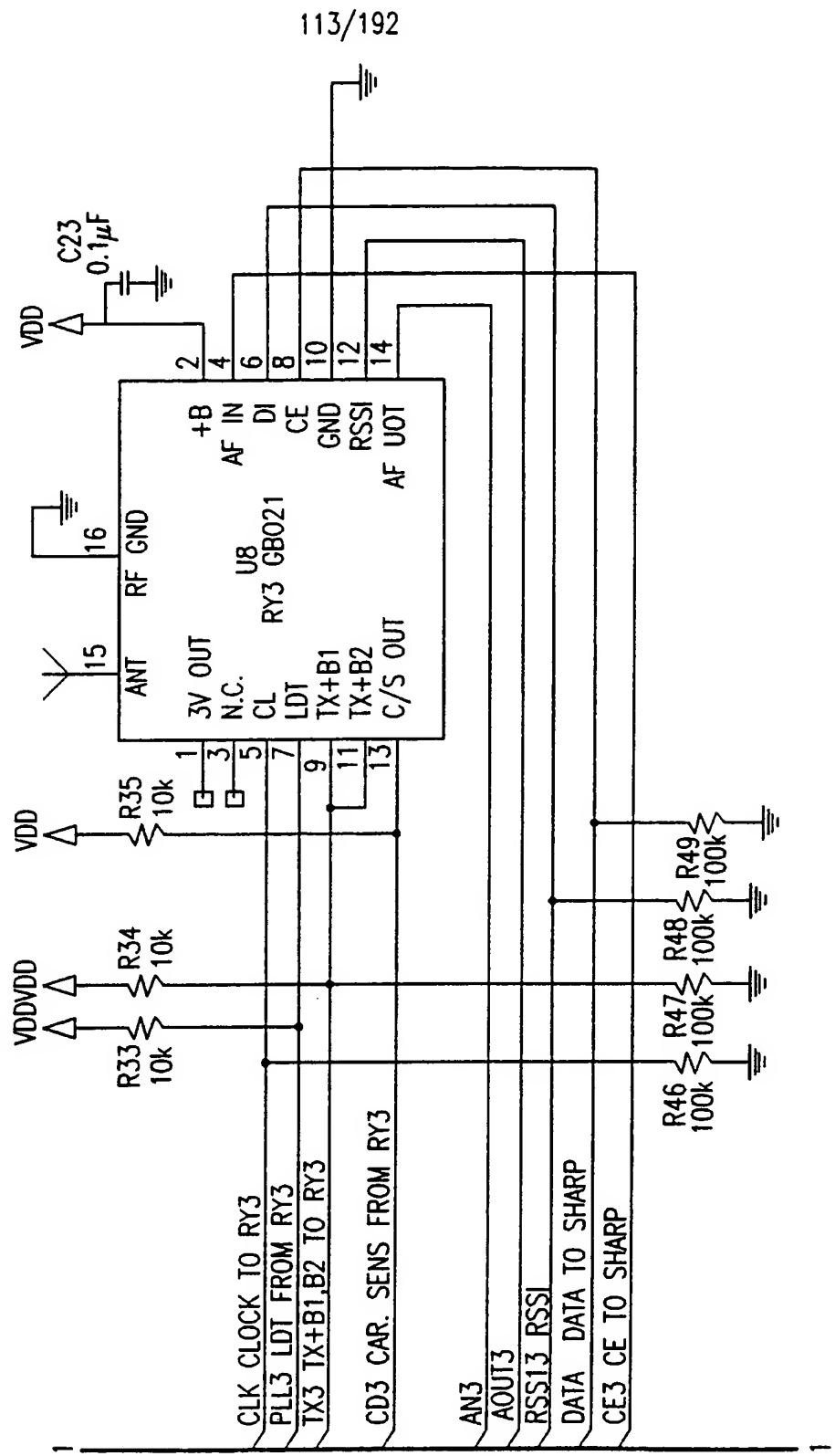
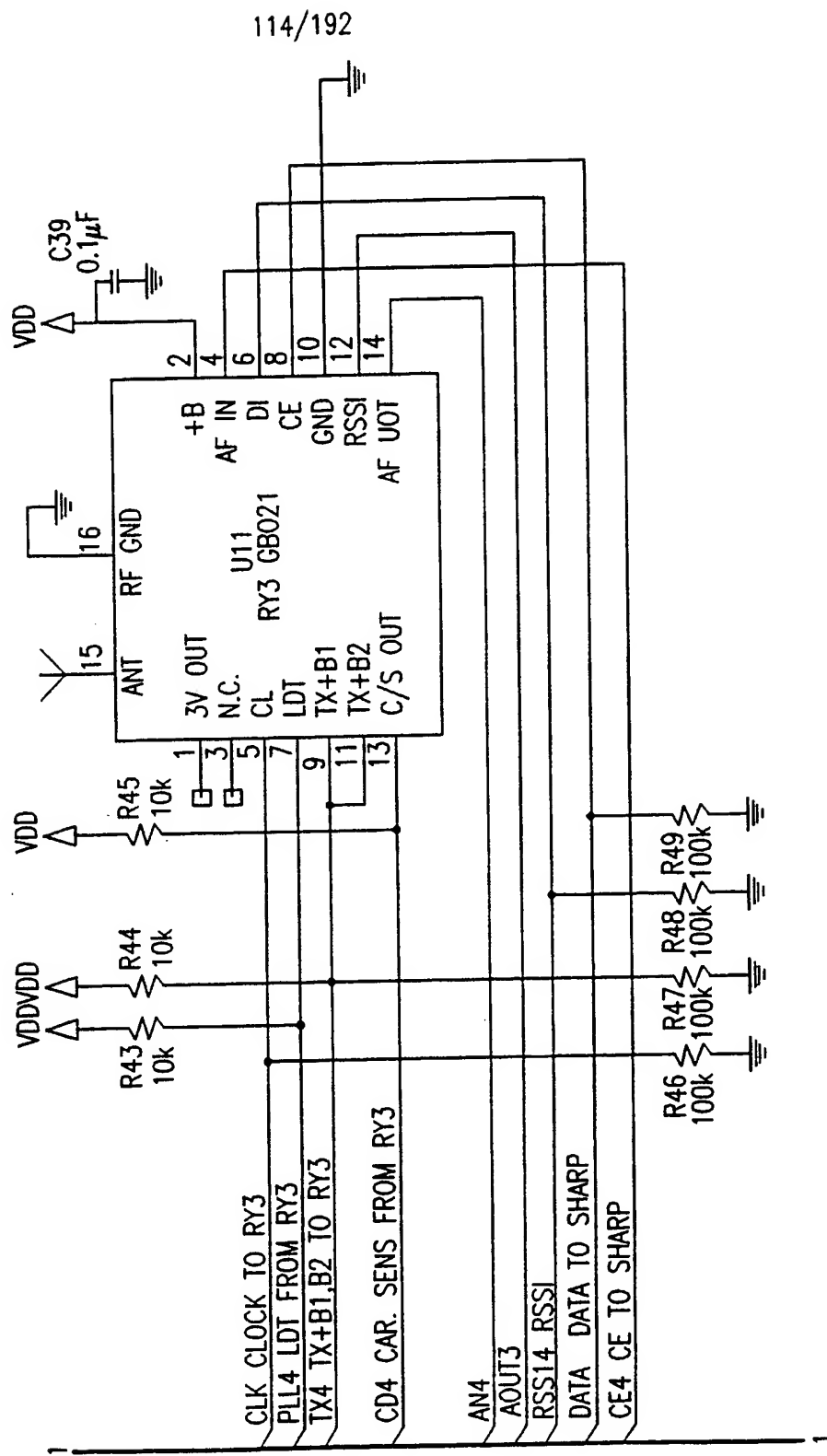
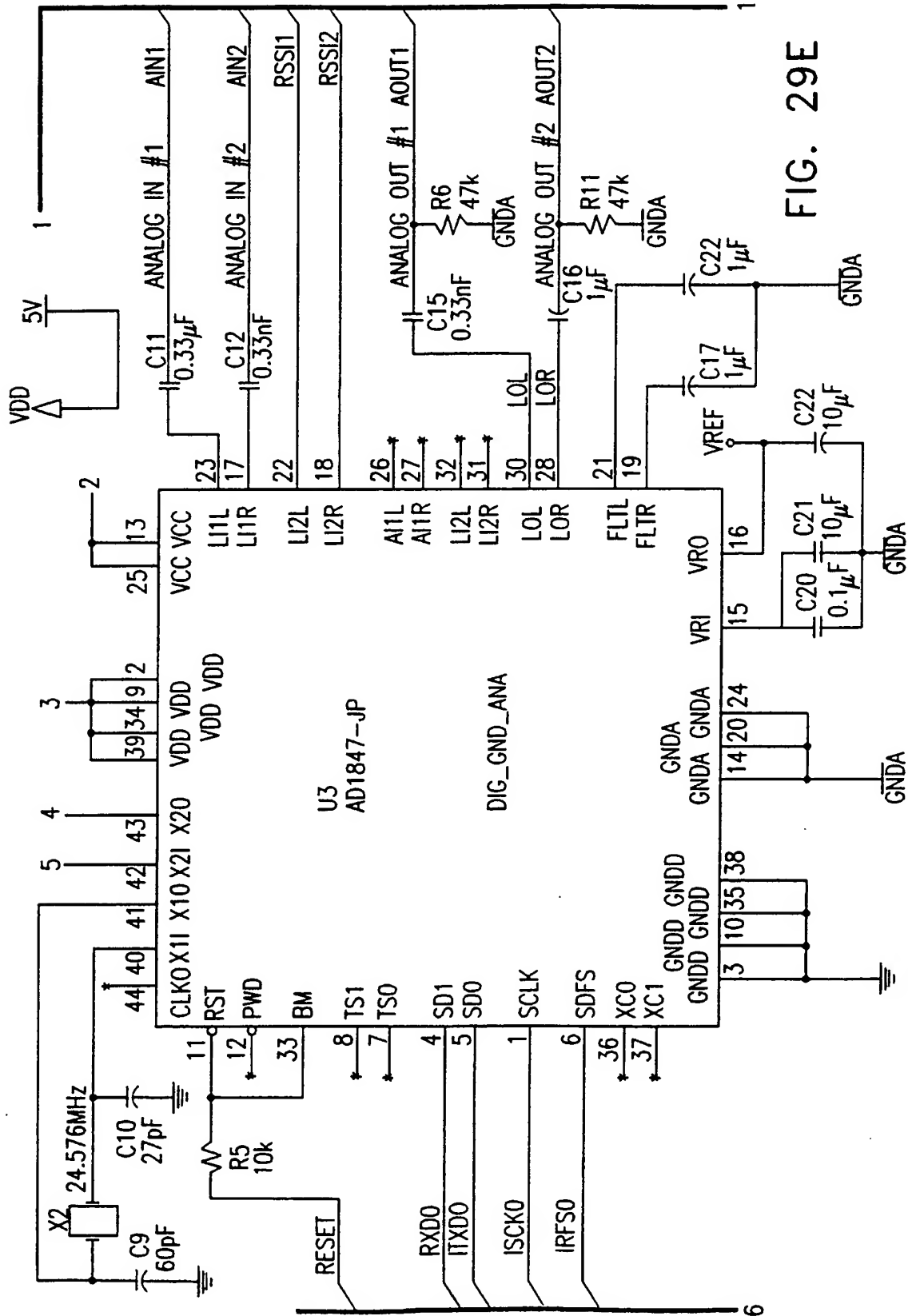


FIG. 29D



115/192



116/192

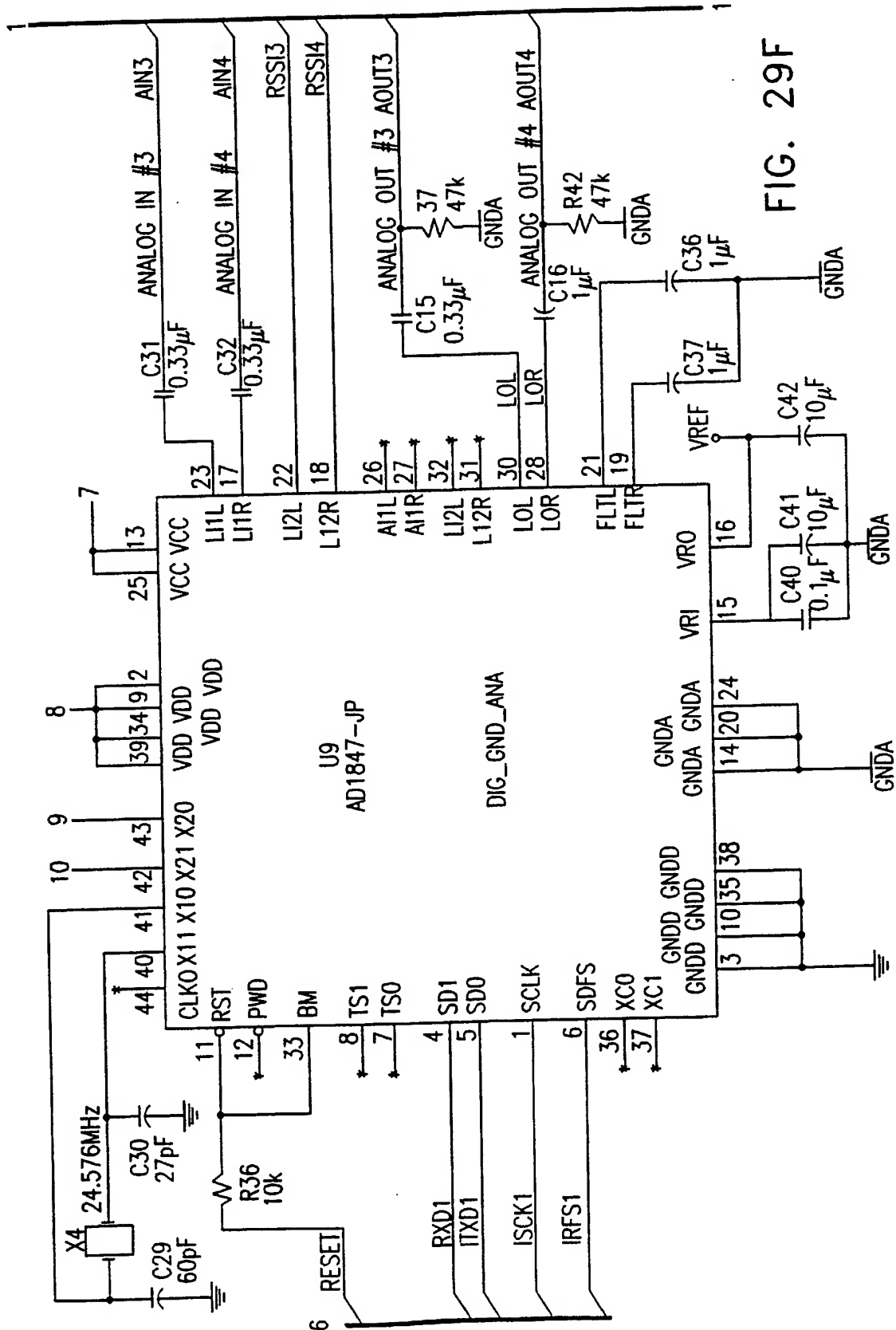
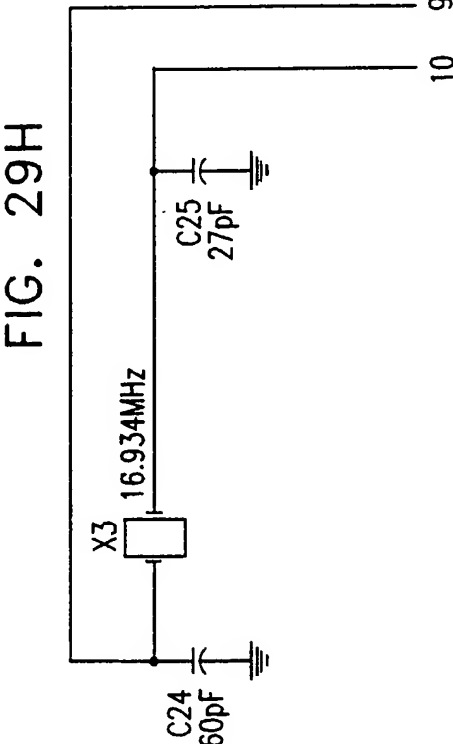
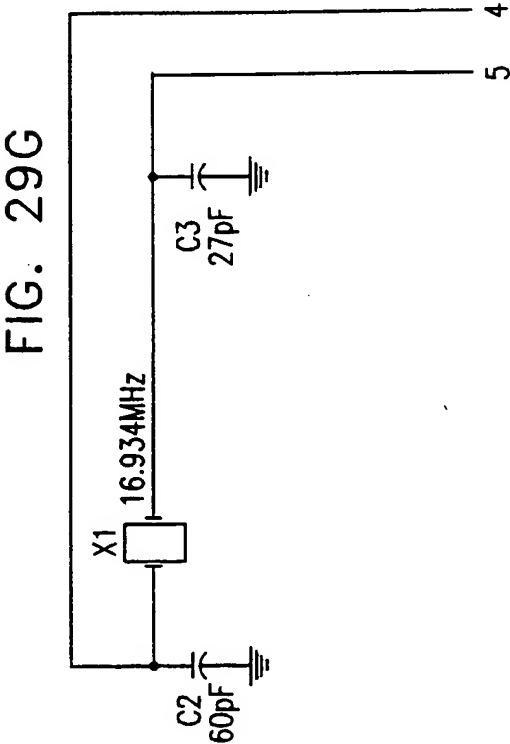
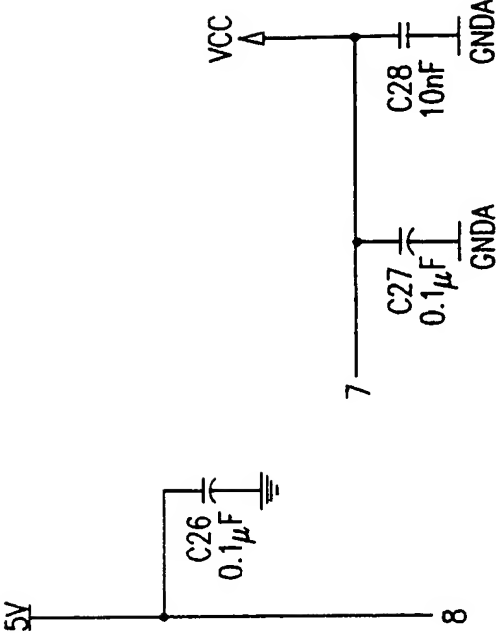
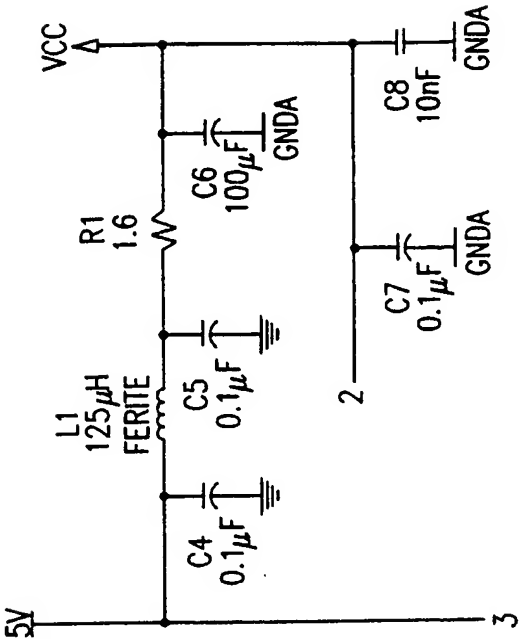


FIG. 29F



118/192

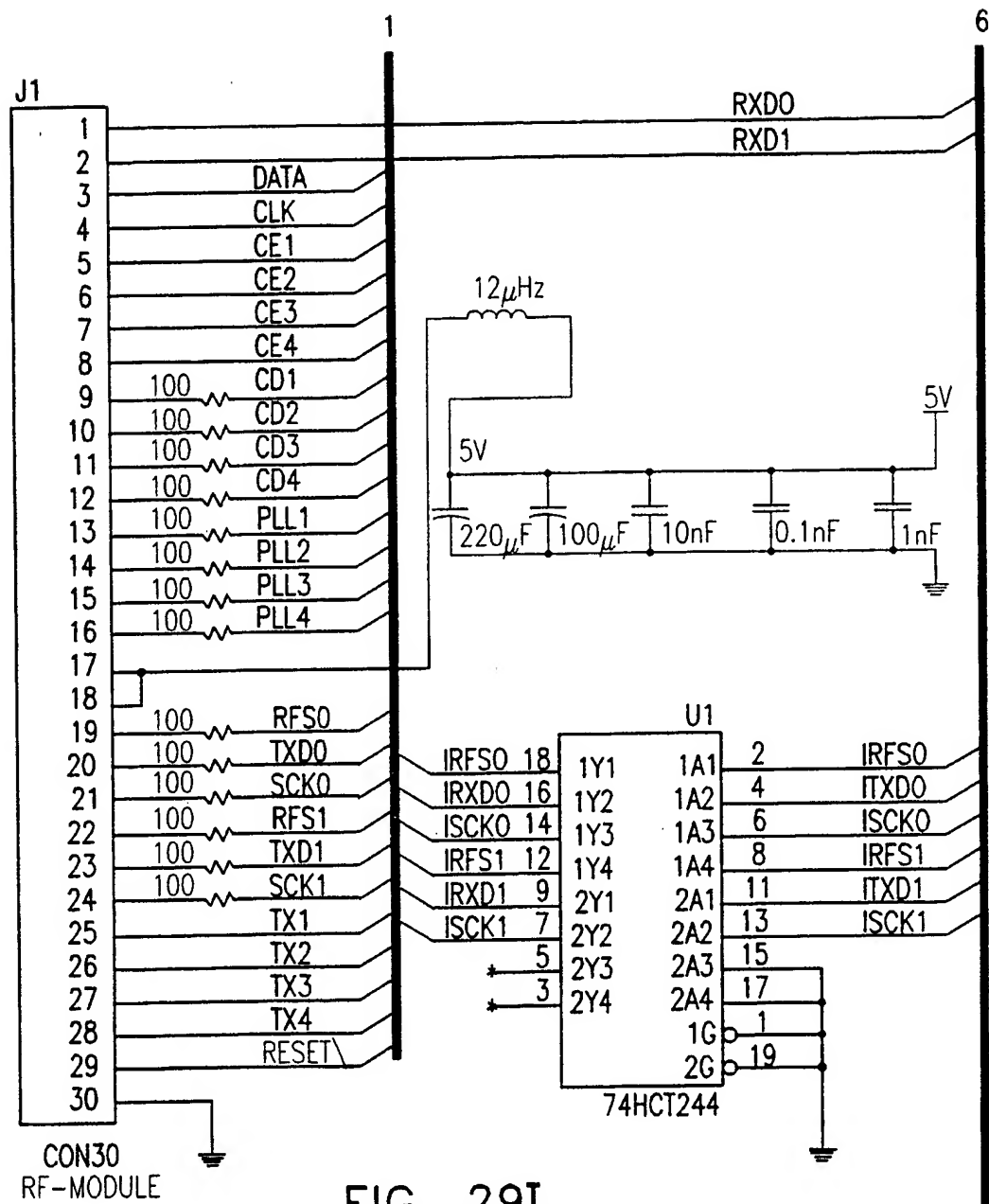
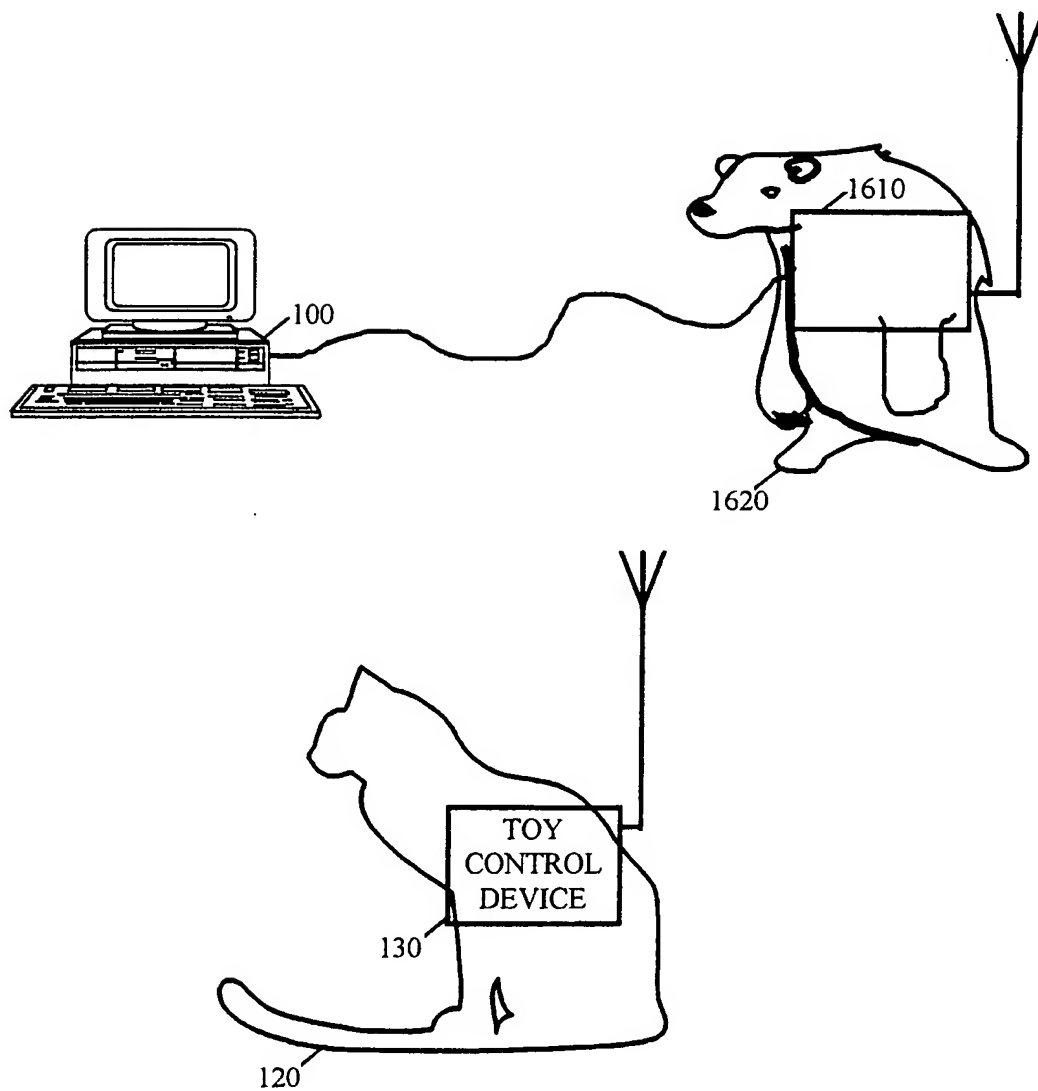


FIG. 29I



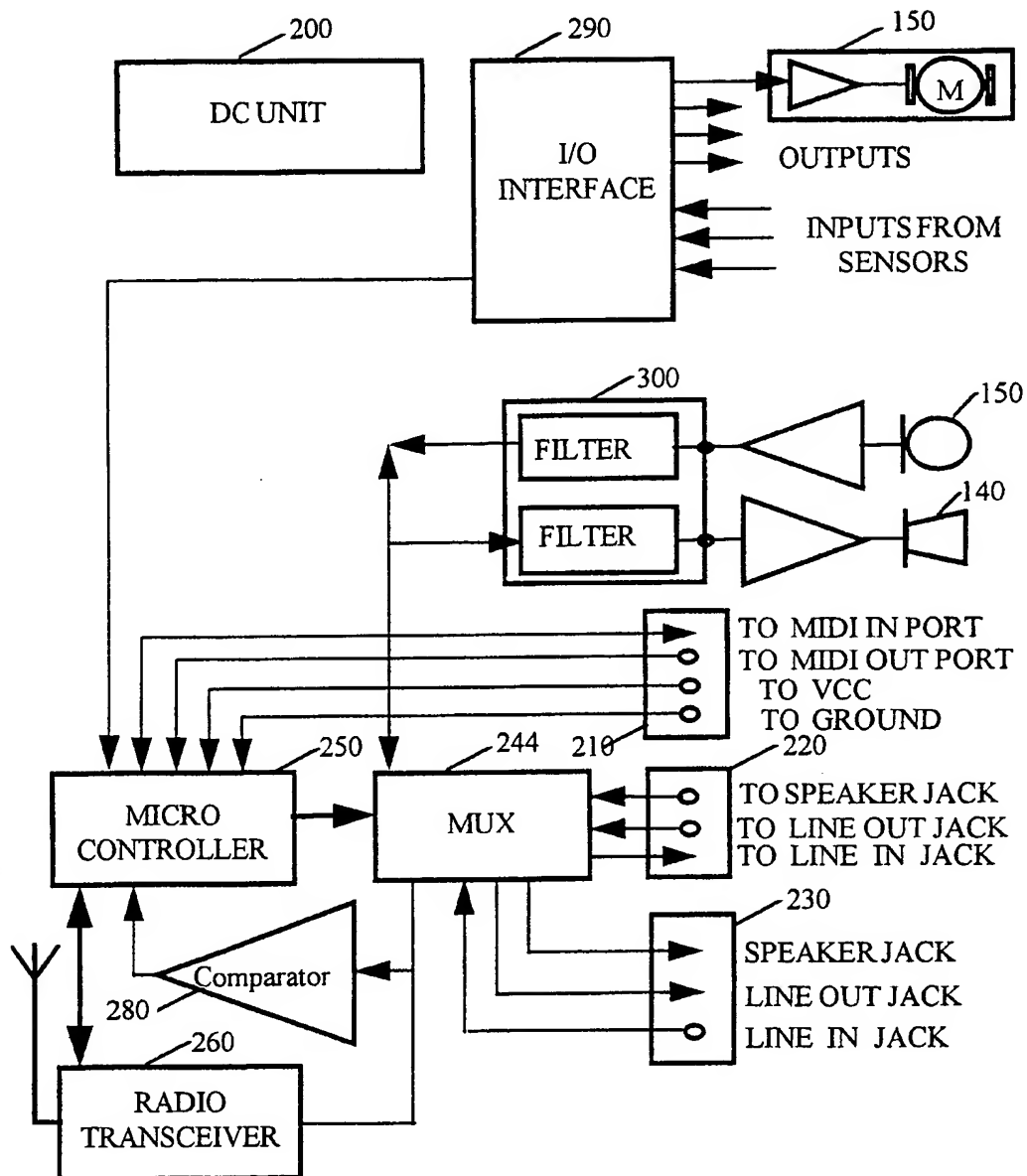
119/192

FIGURE 30



120/192

FIGURE 31



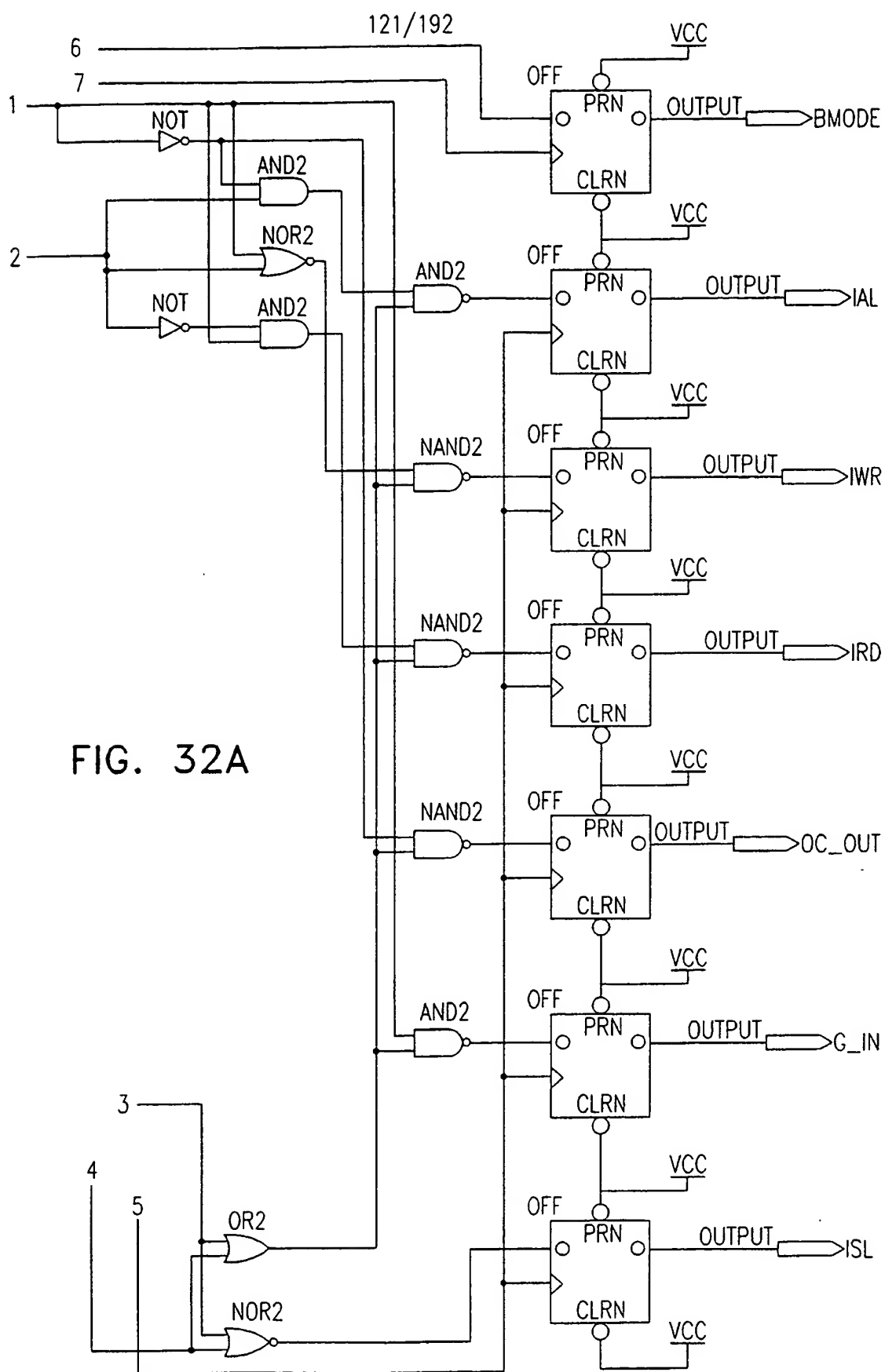


FIG. 32A

122/192

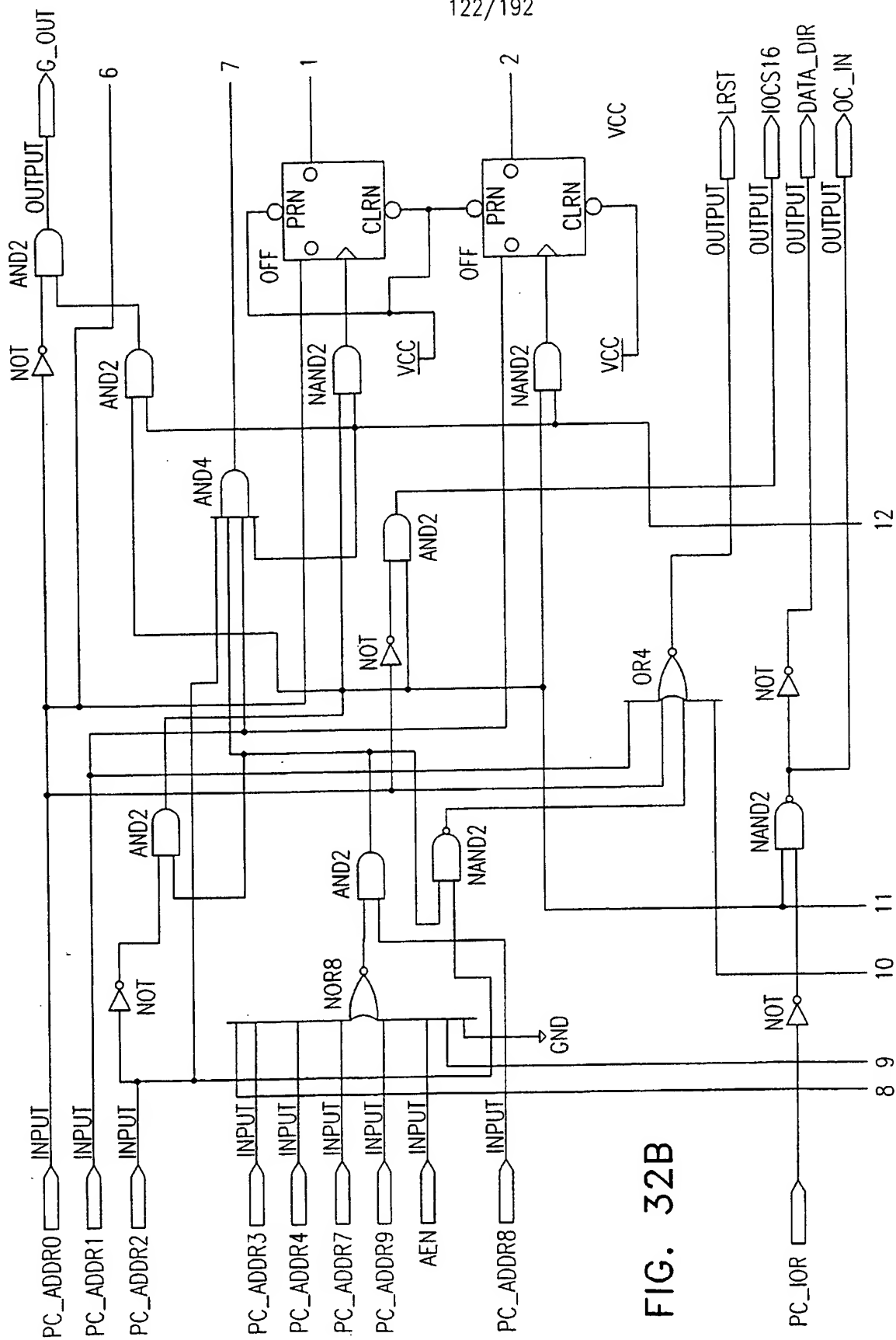
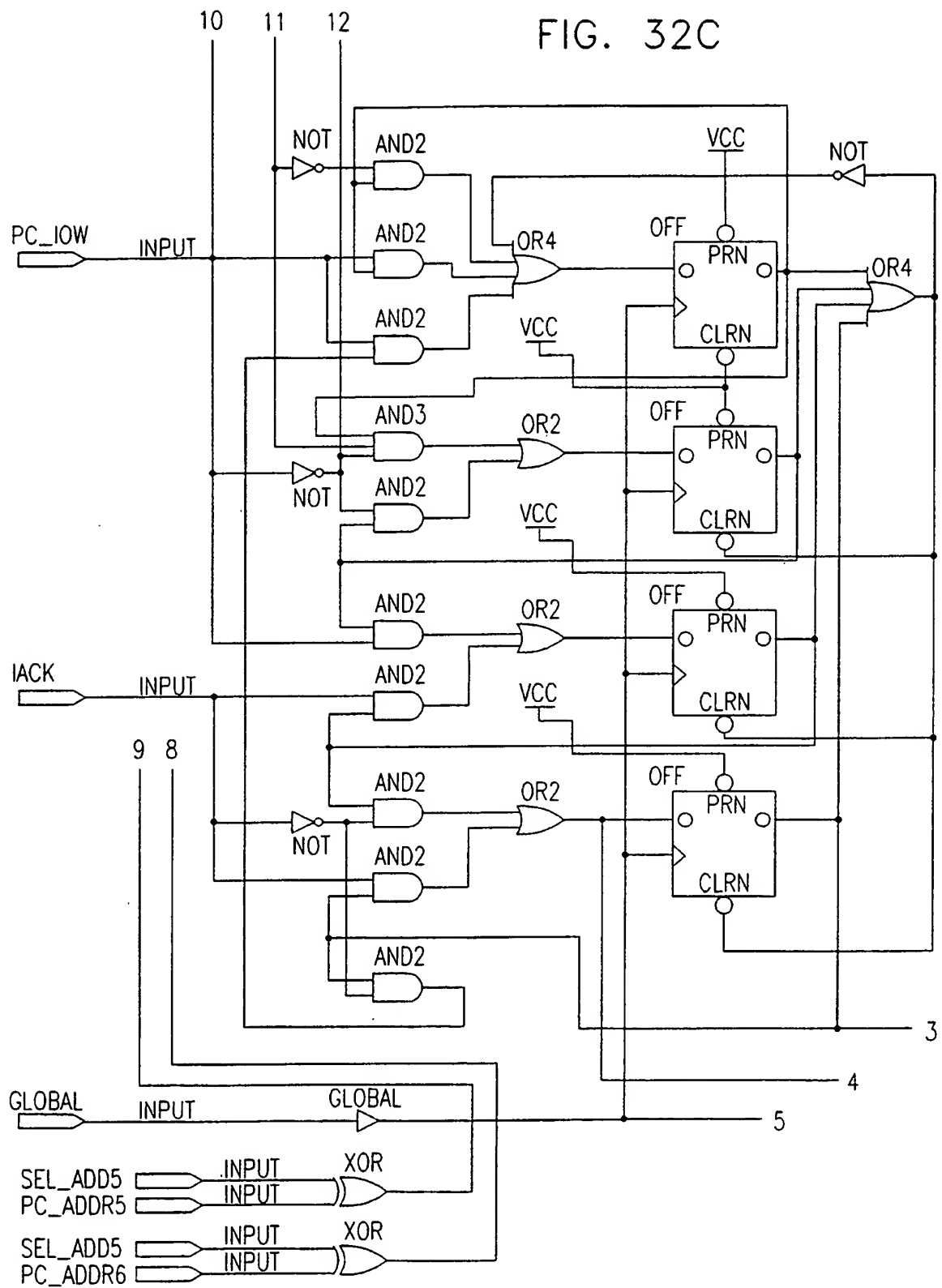


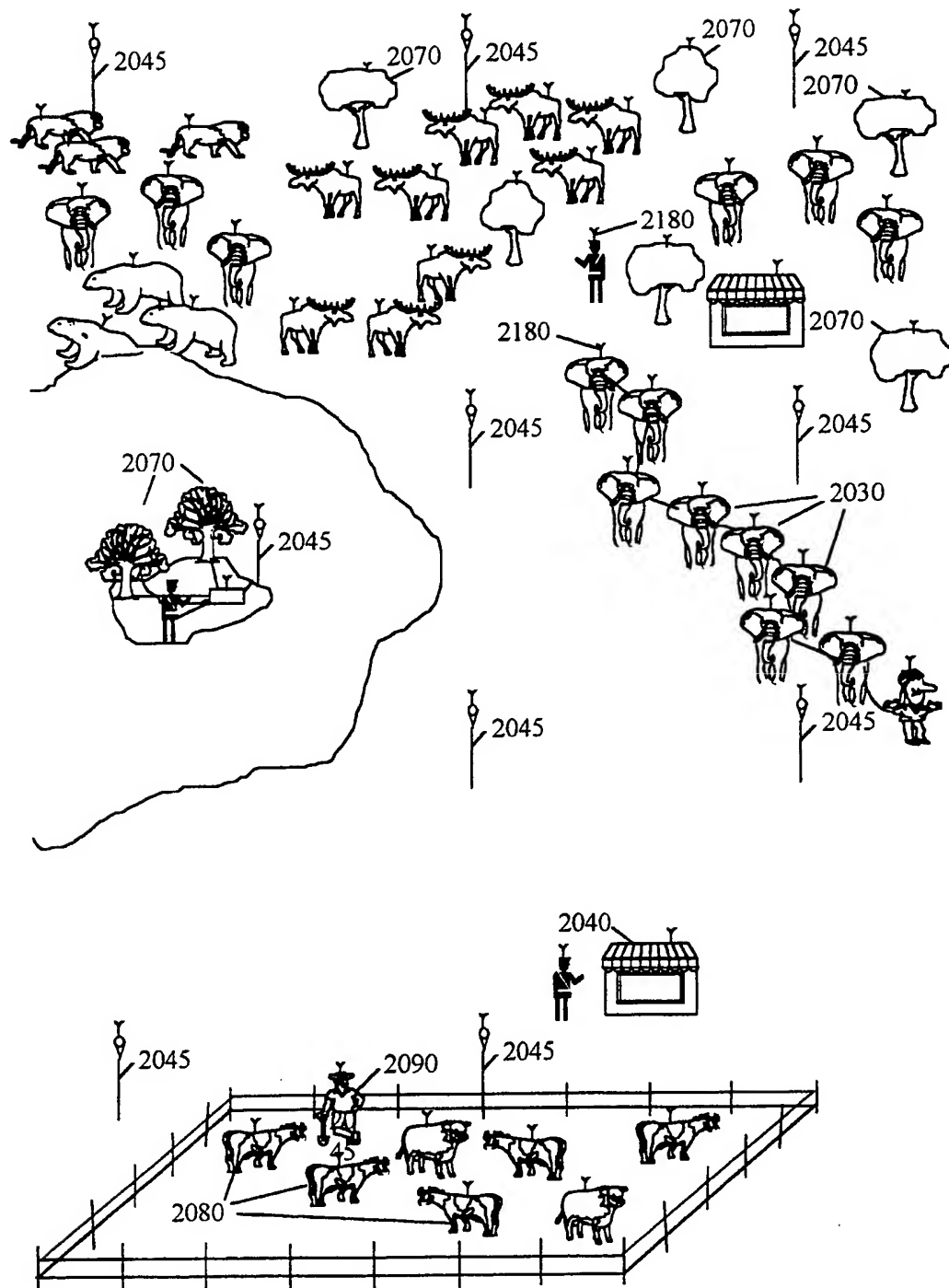
FIG. 32B

123/192

FIG. 32C

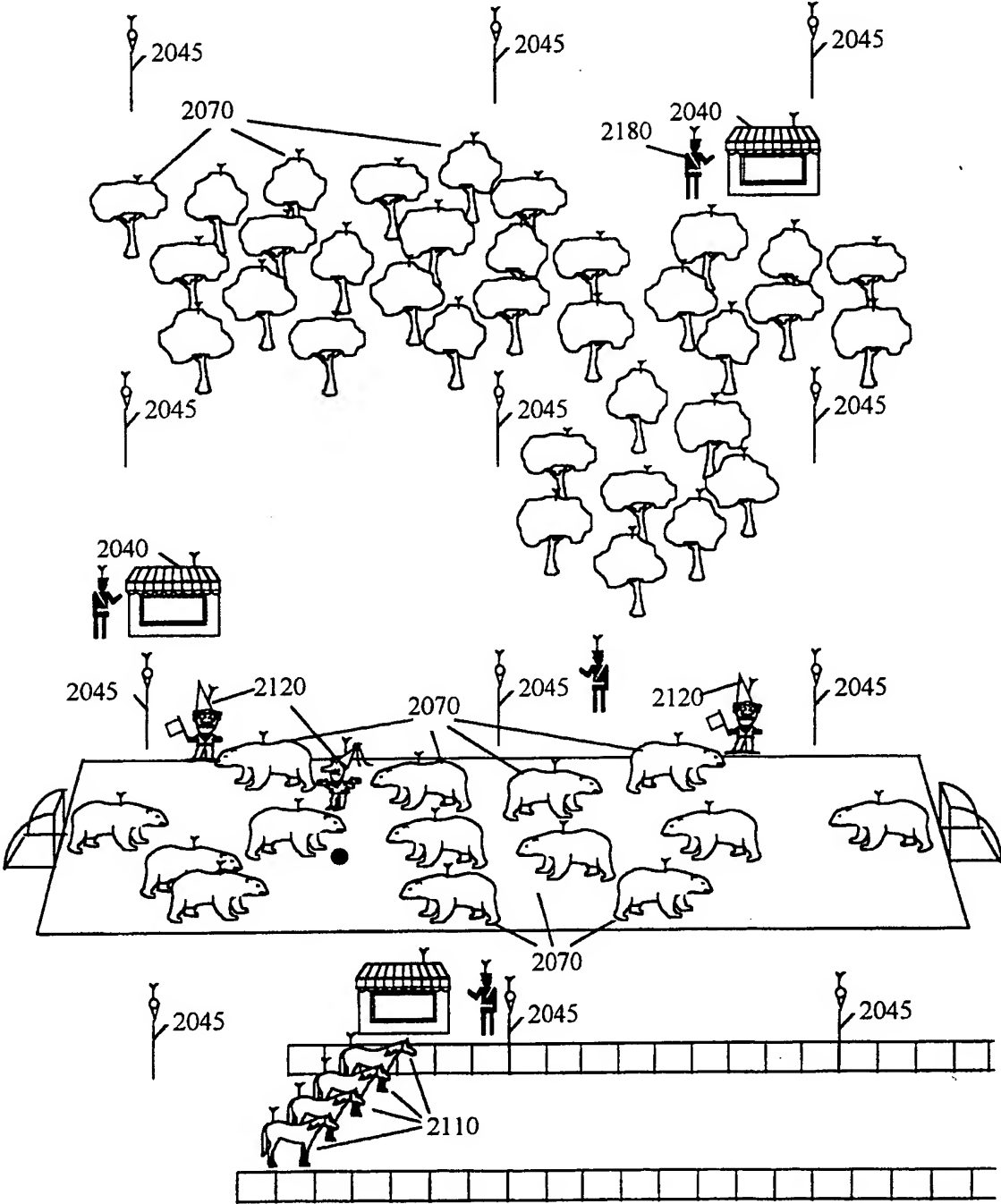


124/192  
Figure 33A



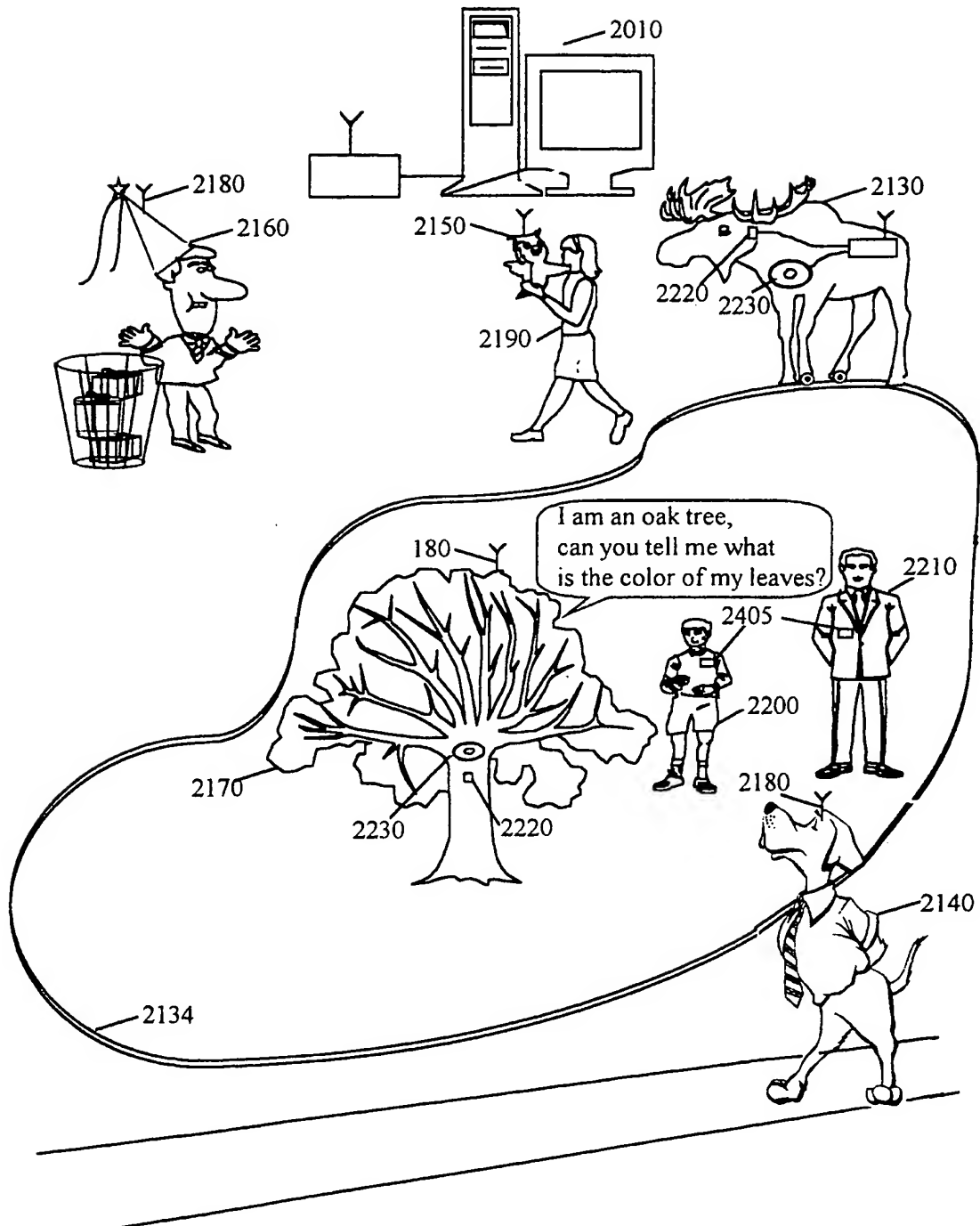


126/192  
Figure 33C

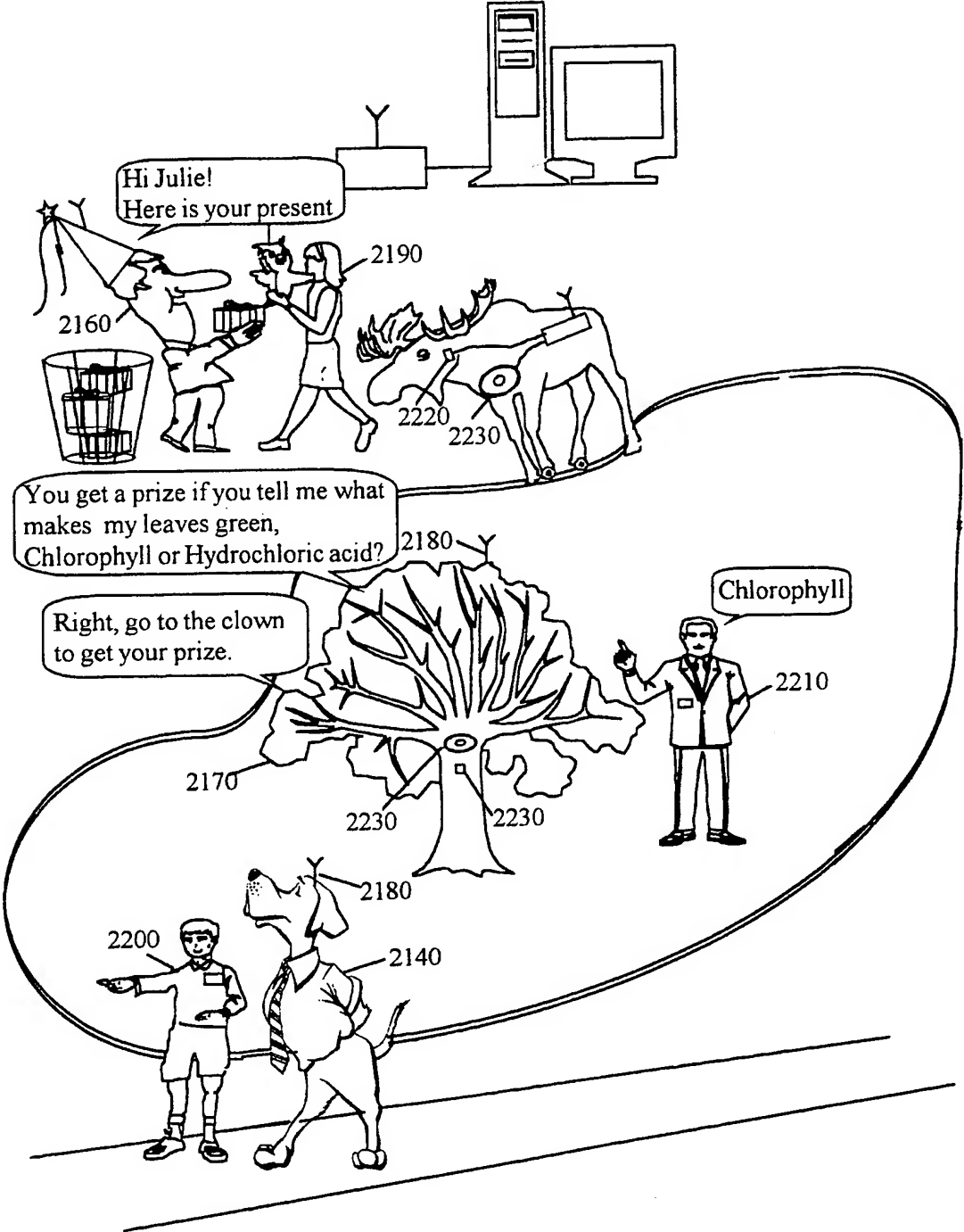




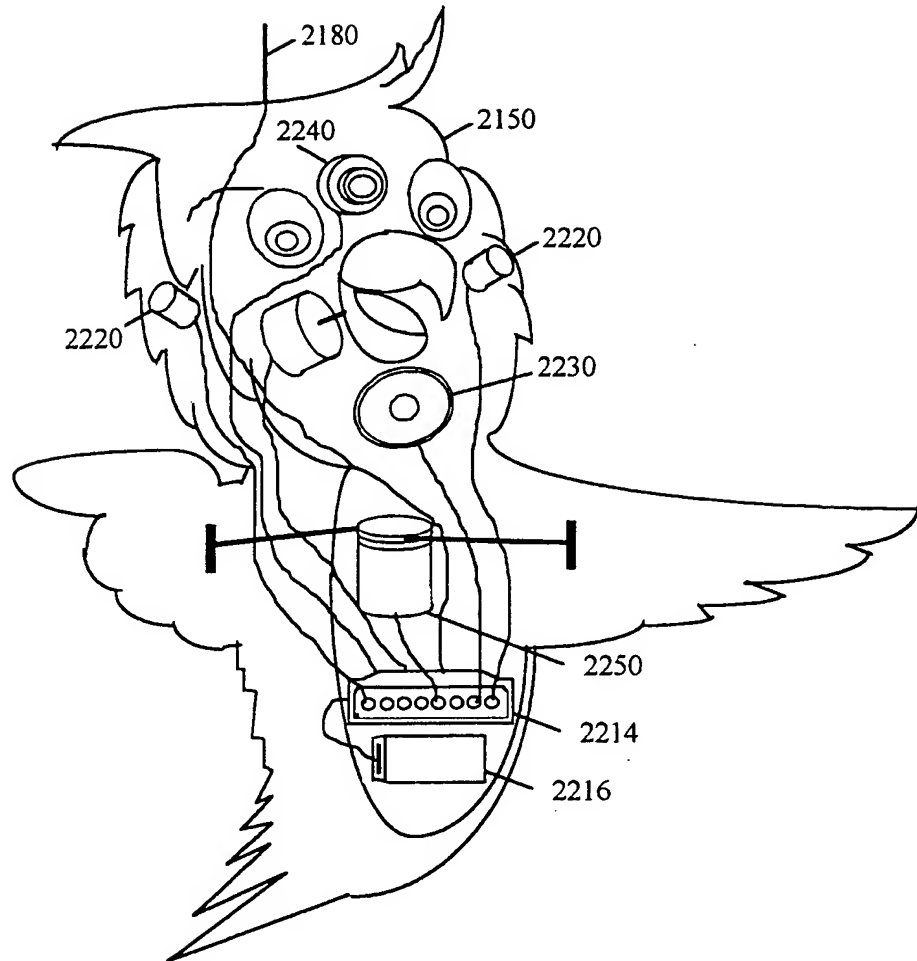
127/192  
Figure 34



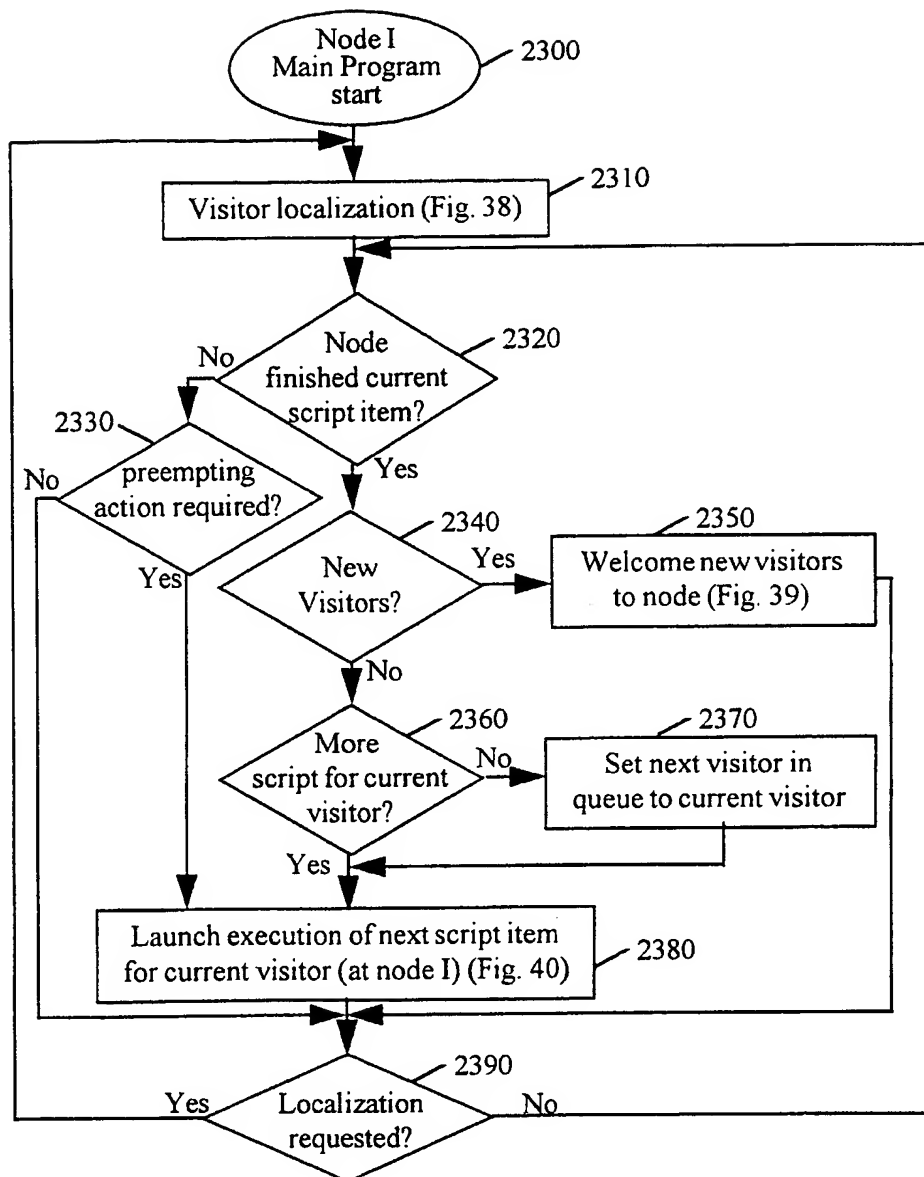
128/192  
Figure 35



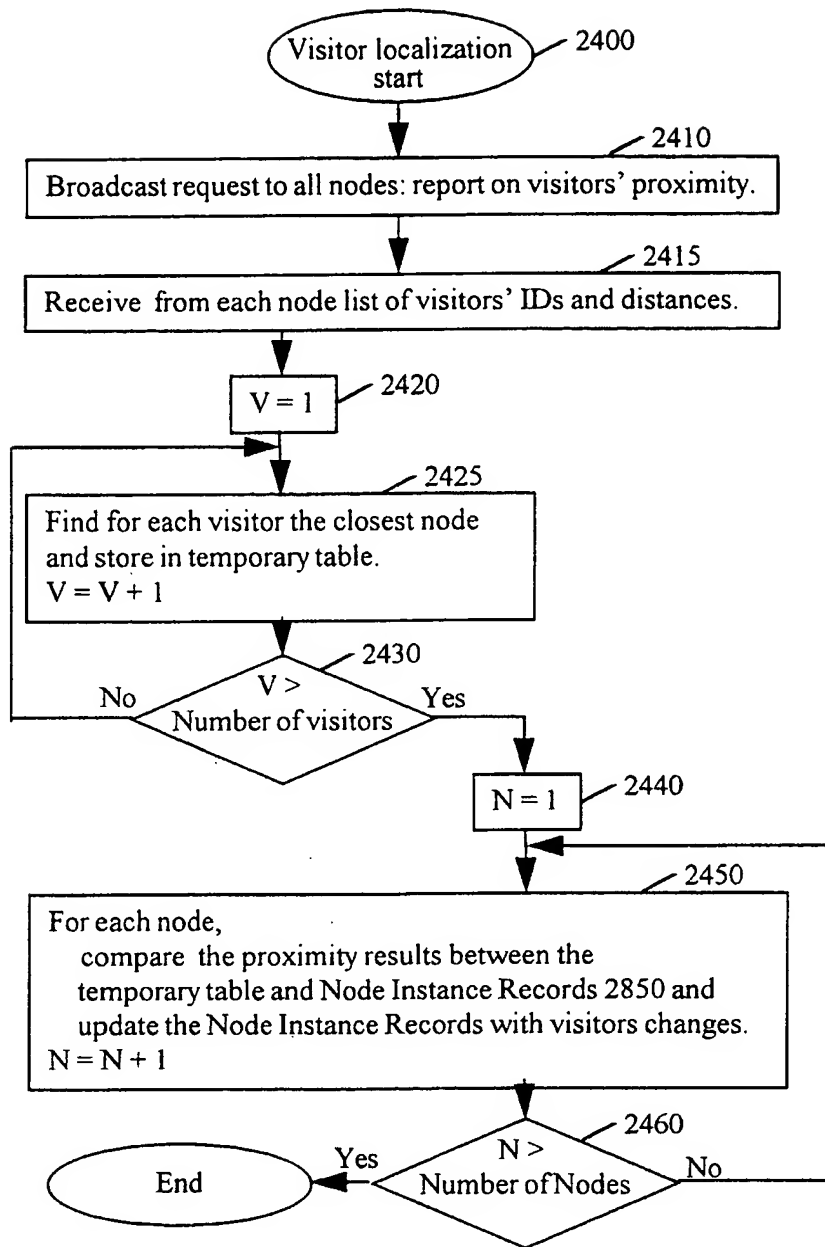
129/192  
Figure 36



130/192  
Figure 37

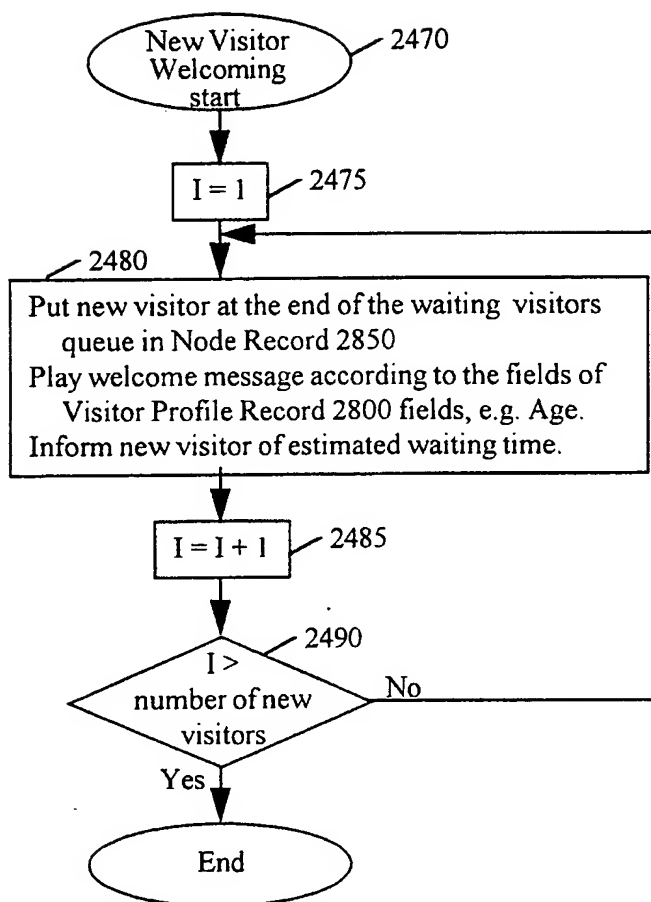


131/192  
Figure 38

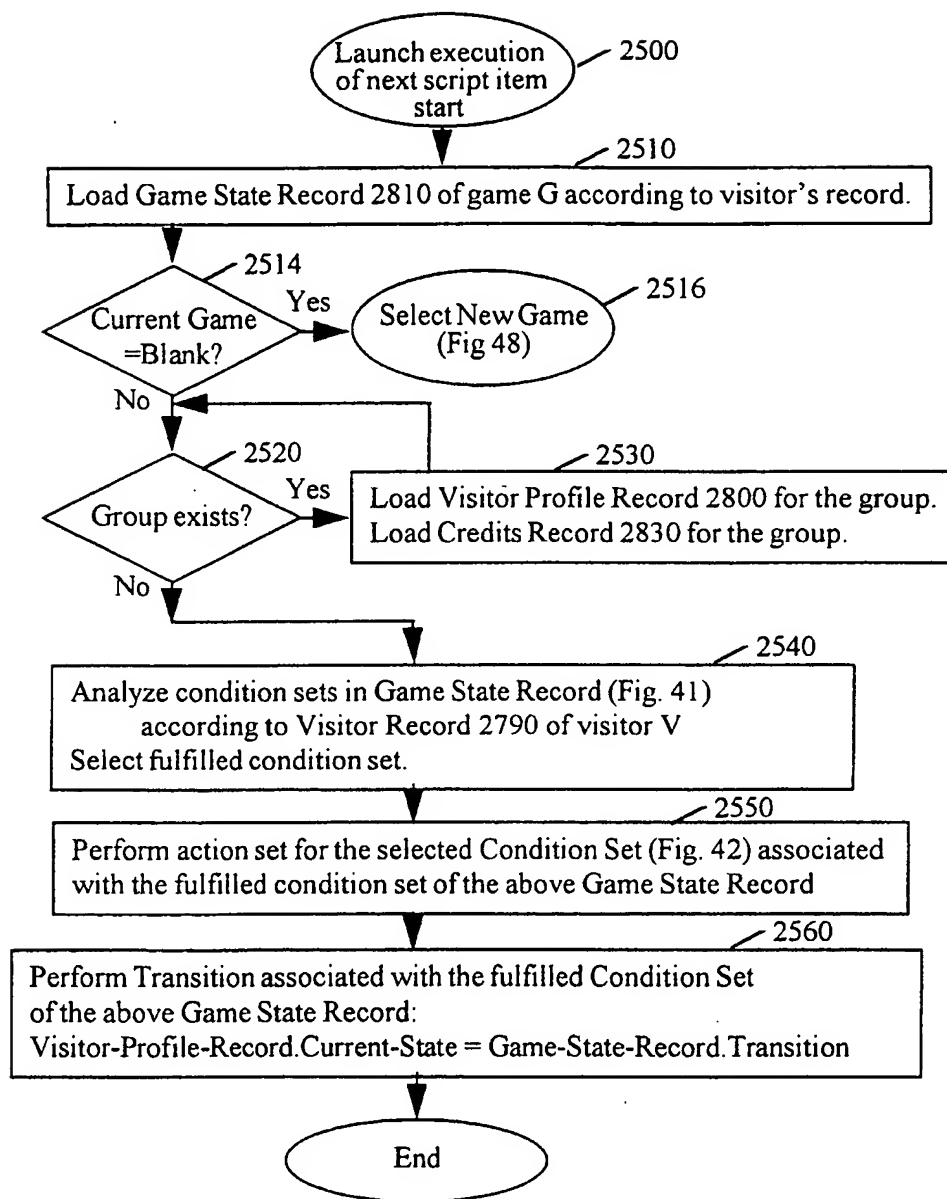


132/192

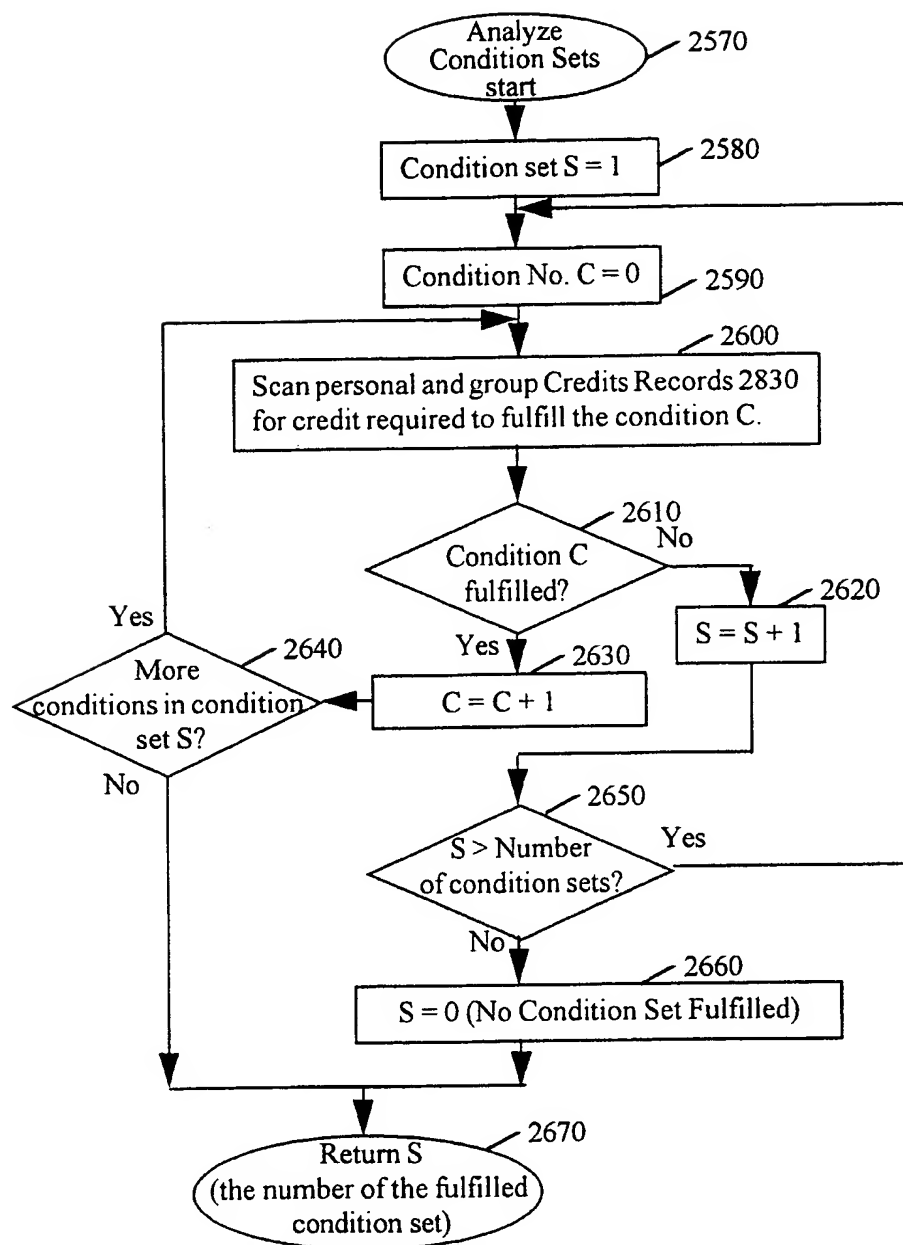
Figure 39



133/192  
Figure 40



134/192  
Figure 41





135/192  
Figure 42

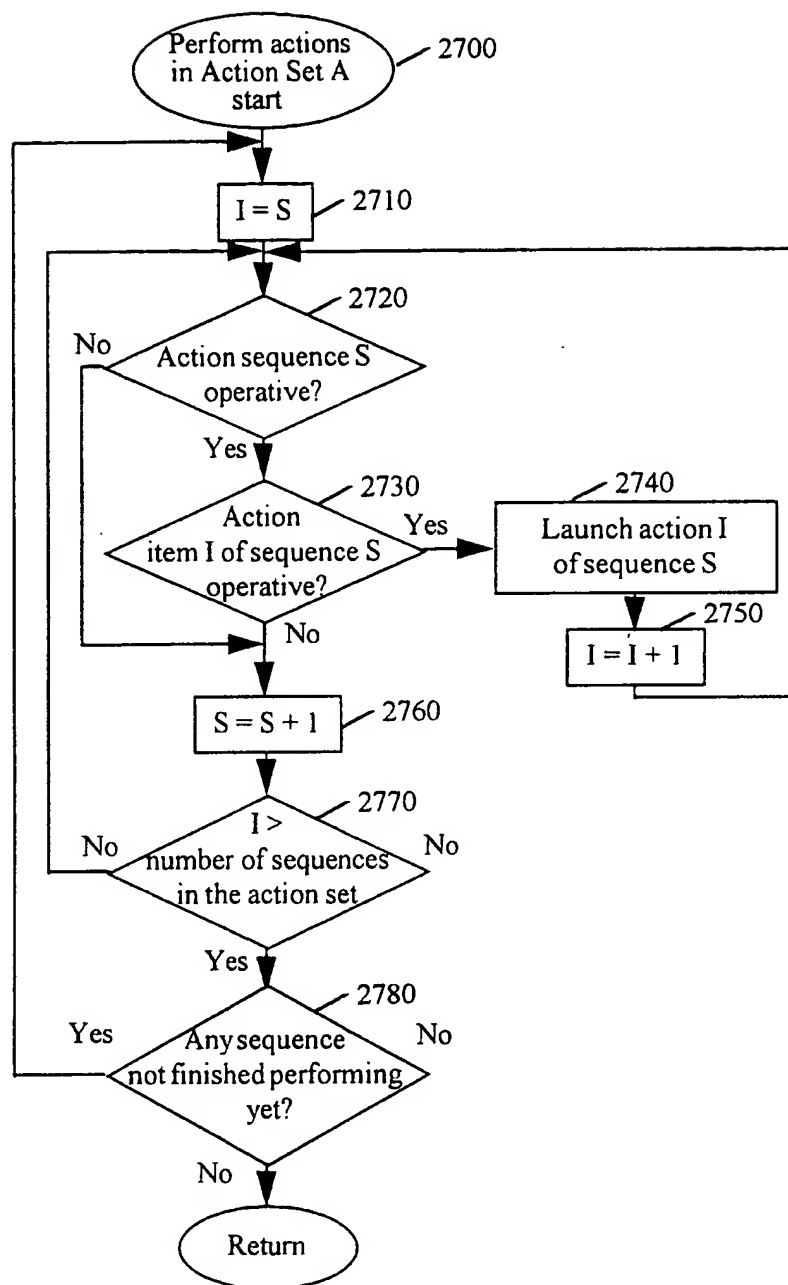
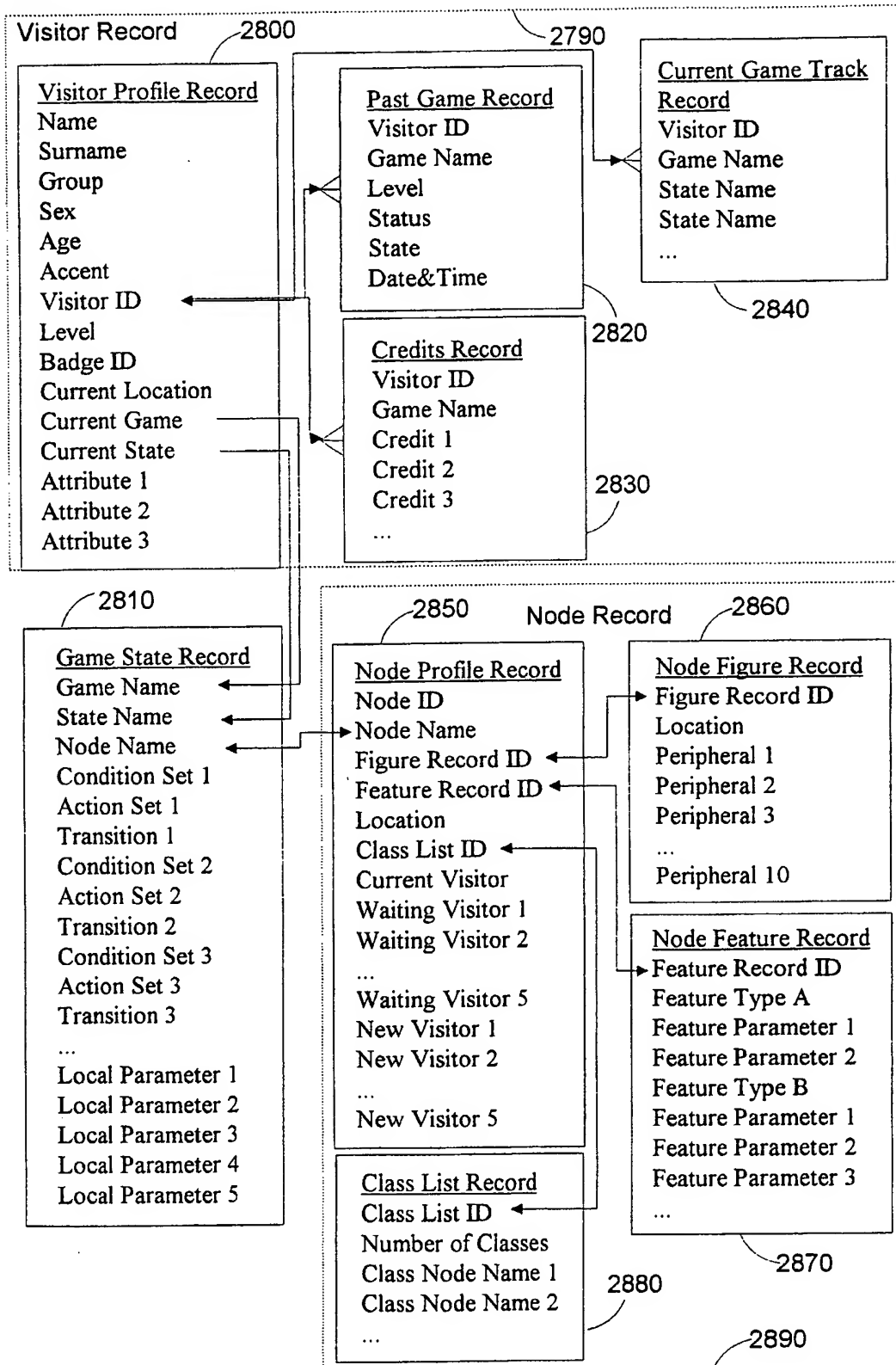


Figure 43A

136/192



**Figure 43B****137/192**

2900

2910

Play Record

Play Name

Pre Play Processing

Post Play Processing

Play List Label

Number of Parameters

Expression A Parameter 1

Expression A Parameter 2

...

Pre Process ()

Play List

Play List Type

Number of Play Elements

Play File Element 1 (pointer/label)

Play File Element 2 (pointer/label)

...

Play File Element 1

Play File Type

Number of Parameters

Parameter-1

Parameter-2

...

Number of Expressions

Expression Type A

Number of Parameters

Expression A Parameter 1

Expression A Parameter 2

...

Expression Type B

Number of Parameters

Expression B Parameter 1

Expression B Parameter 2

...

Expression Type N

Number of Parameters

Expression N Parameter 1

Expression N Parameter 2

...

Post Process

Frequent Inquiry Record

Answer Phrase Name

Number of Keywords

Keyword 1

Weight 1

Keyword 2

Weight 2

Keyword 3

Weight 3

...

2915

Temporary Table

Number of Phrases

Phrase 1

Weight 1

Phrase 2

Weight 2

Phrase 3

Weight 3

...

Figure 43C

138/192

2920

Game Record

Game Name

Introduction Phrase

Next Game

Game-Name

Age Range

min    max

Level Range

min    max

Required Credits:

Boulean expression of credits

Required Past Games:

Boulean expression of games

Number of Participating Nodes

Node-Name-1,

Node-Name-2,

Node-Name-3,

...

**139/192**  
Figure 44

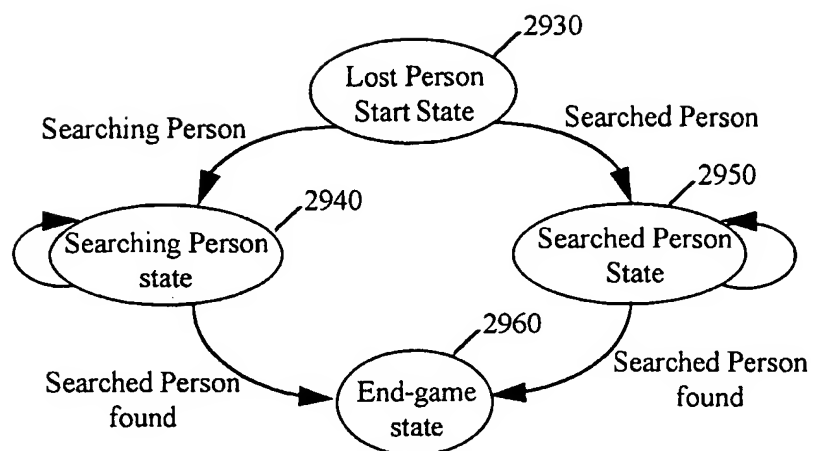


Figure 45

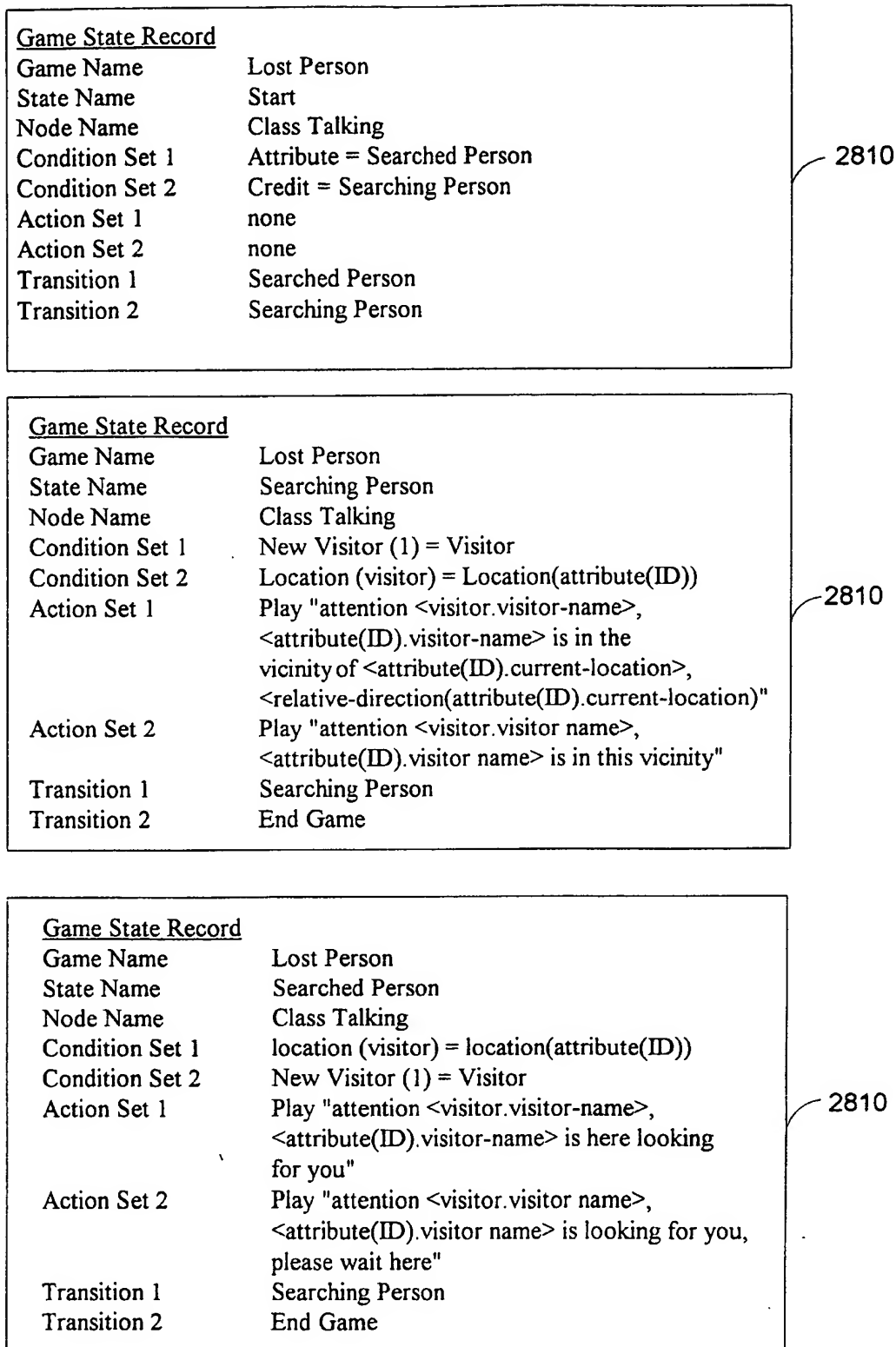
2790 140/192

|                                                                                                                                                                                                                                                                                                                                                                       |  |                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Visitor Profile Record</u><br>Name John<br>Surname Smith<br>Group Class D<br>Sex NA<br>Age Adult<br>Accent NA<br>Visitor ID 879634236<br>Level NA<br>Badge ID 2384<br>Current Location Bear 12<br>Current Game Lost Person<br>Current State Searching Person<br>Current Credits NA<br>Attribute 1 Teacher<br>Attribute 2 Searching Person<br>Attribute 3 879634279 |  | 2820<br><u>Past Game Record</u><br>Visitor ID 879634236<br>Game Name Zoo Keeper<br>Level 3<br>Status paused<br>State Dear feeding<br>Date&Time 1508971310 |
|                                                                                                                                                                                                                                                                                                                                                                       |  | 2840<br><u>Current Game Track Record</u><br>Visitor ID 879634236<br>Game Name Lost Person<br>State Name Guard 3<br>State Name Clown 21                    |

|                                                                                                                                                                                                                                                                                                                                               |                                                                                               |                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2800<br><u>Visitor Profile Record</u><br>Name George<br>Surname Miller<br>Group Dragons<br>Sex NA<br>Age 10<br>Accent NA<br>Visitor ID 879634279<br>Level 2<br>Badge ID 4512<br>Current Location Clown 23<br>Current Game Lost Person<br>Current State Searched Person<br>Attribute 1 Searched Person<br>Attribute 2 879634236<br>Attribute 3 |                                                                                               | 2820<br><u>Past Game Record</u><br>Visitor ID 879634279<br>Game Name Zoo Keeper<br>Level 2<br>Status paused<br>State Bear feeding<br>Date&Time 1508971310                                              |
|                                                                                                                                                                                                                                                                                                                                               |                                                                                               | 2840<br><u>Current Game Track Record</u><br>Visitor ID 879634279<br>Game Name Lost Person<br>State Name Bear 4<br>State Name Dear 2<br>State Name Lion 14<br>State Name Clown 7<br>State Name Clown 21 |
| 2830<br><u>Credits Record</u><br>Visitor ID 879634279<br>Game Name Zoo Keeper<br>Credit 1 Deer Food                                                                                                                                                                                                                                           | 2830<br><u>Credits Record</u><br>Visitor ID 879634279<br>Game Name Lost Person<br>Credit 1 NA |                                                                                                                                                                                                        |

Figure 46A

141/192



**Figure 46B****142/192**

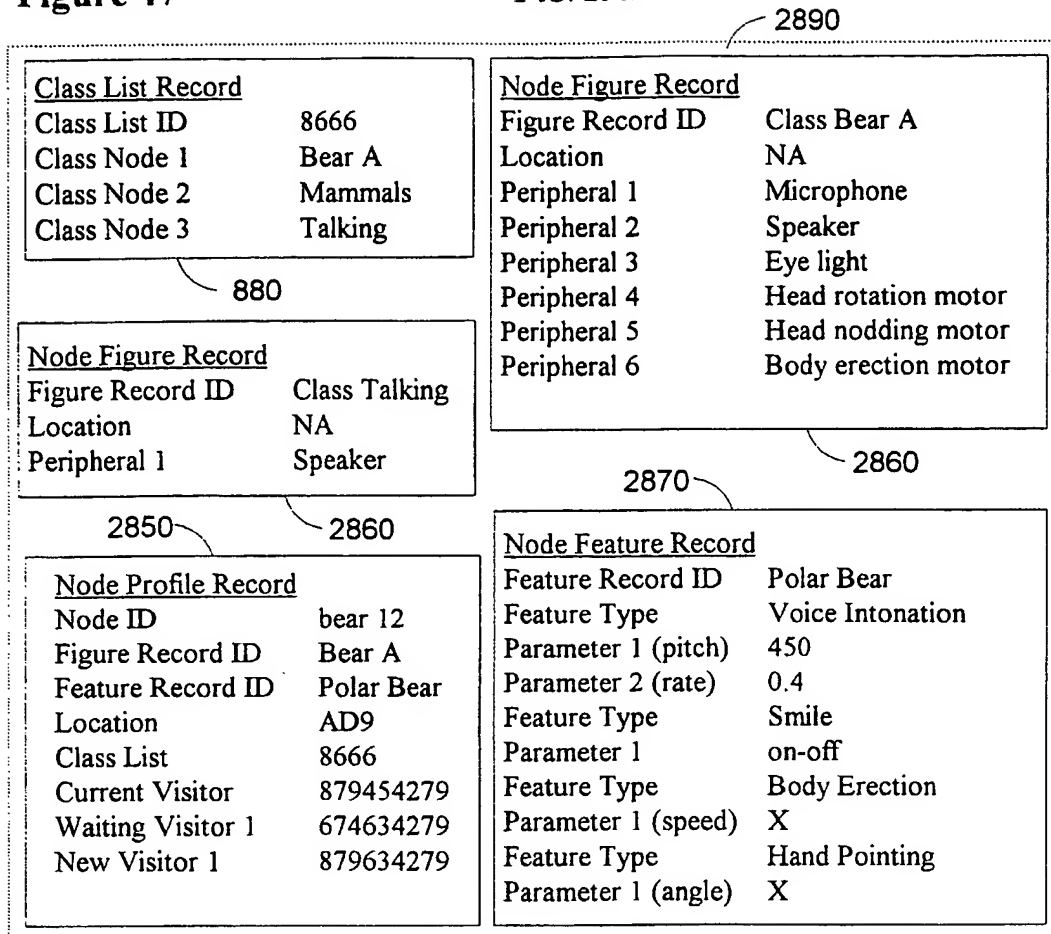
2810

|                          |             |
|--------------------------|-------------|
| <u>Game State Record</u> |             |
| Game Name                | Lost Person |
| State Name               | End-game    |
| Node Name                | Class All   |
| Condition Set 1          | None        |
| Action Set 1             | Close game  |
| Transition 1             | None        |



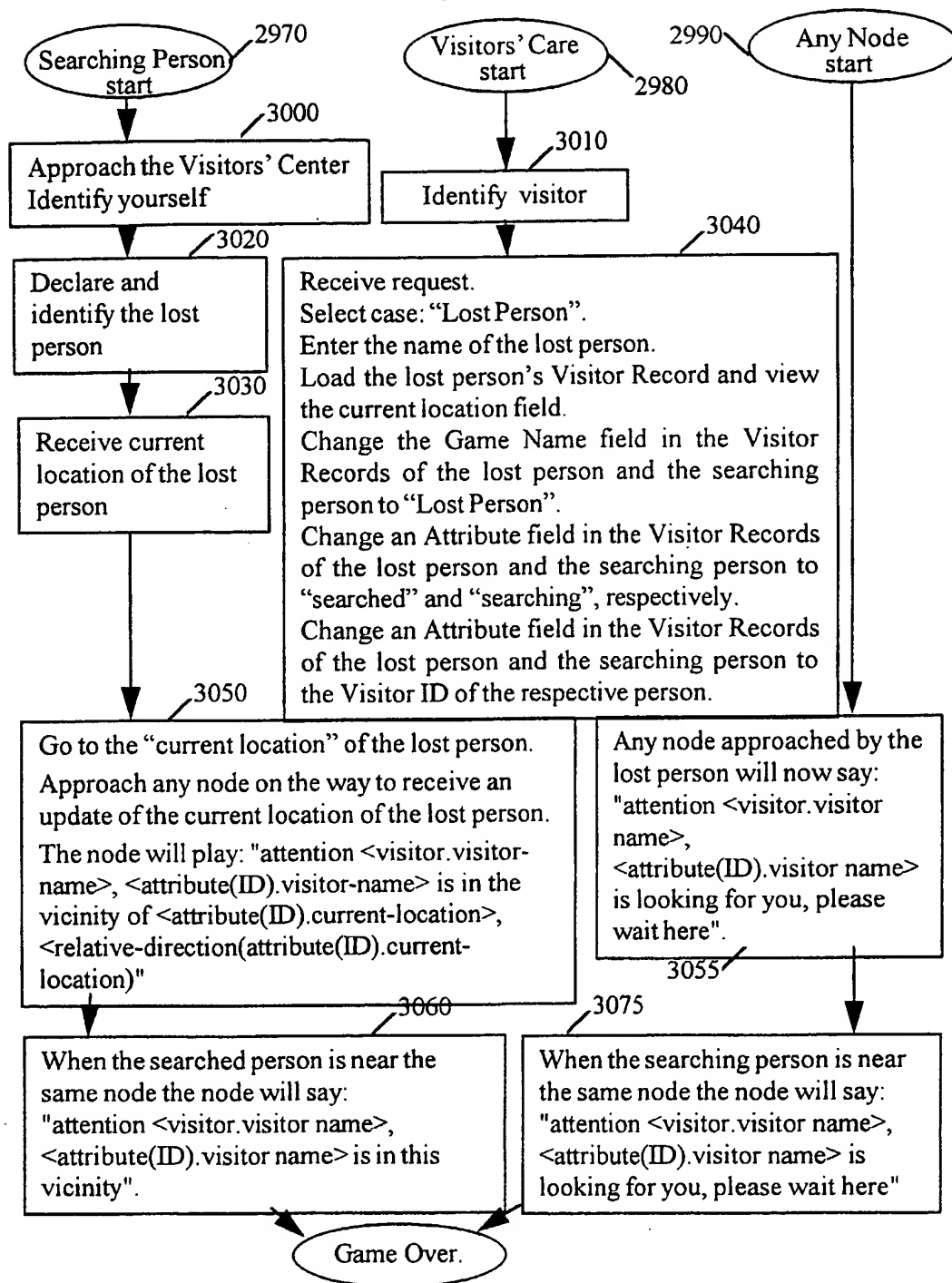
Figure 47

143/192



144/192

Figure 48



145/192  
Figure 49

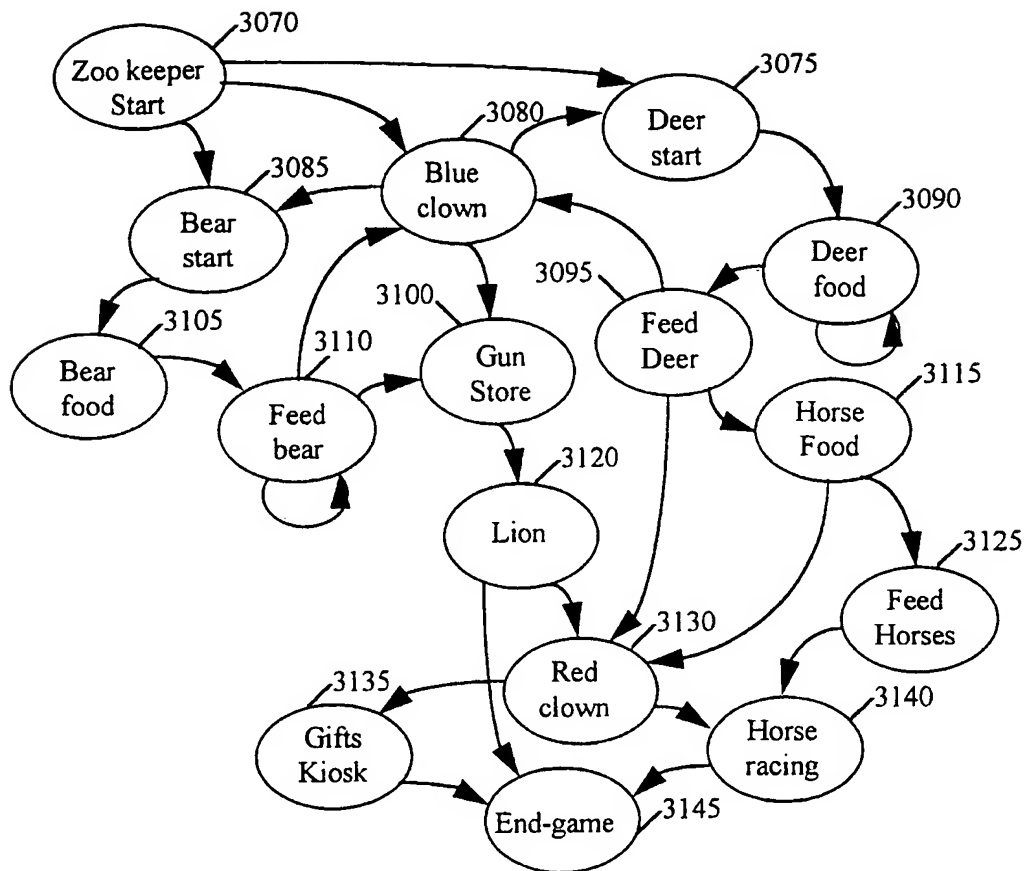


Figure 50A

146/192

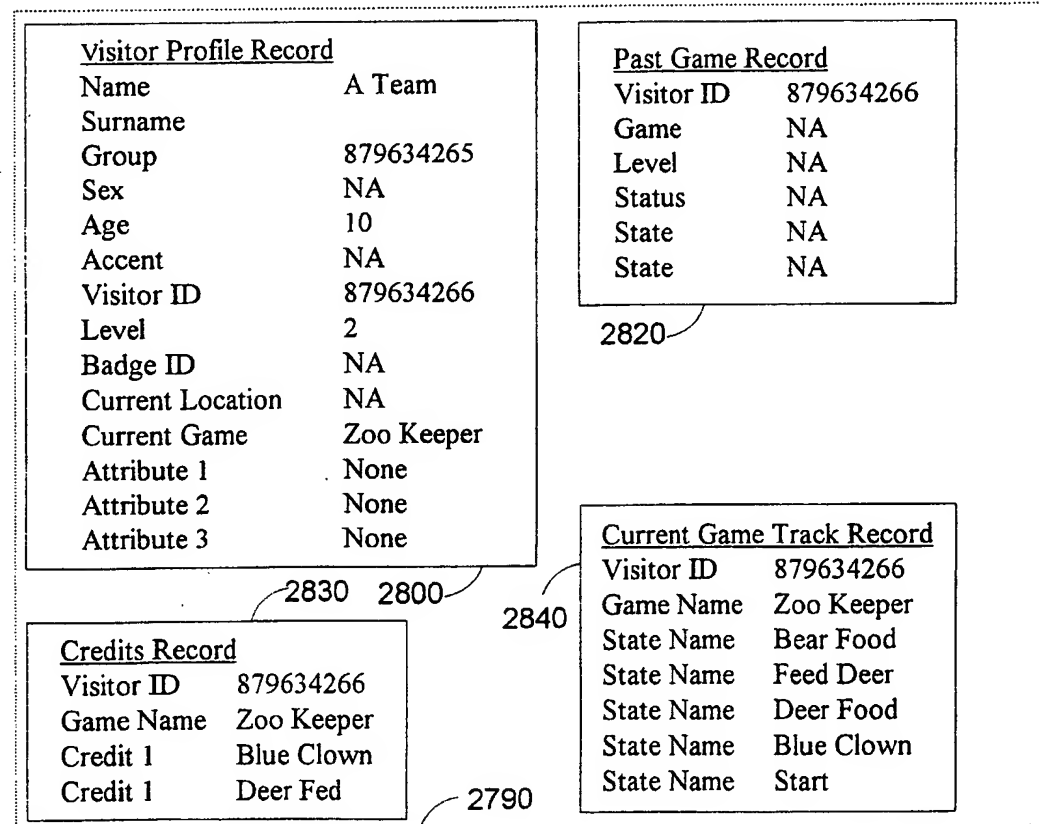
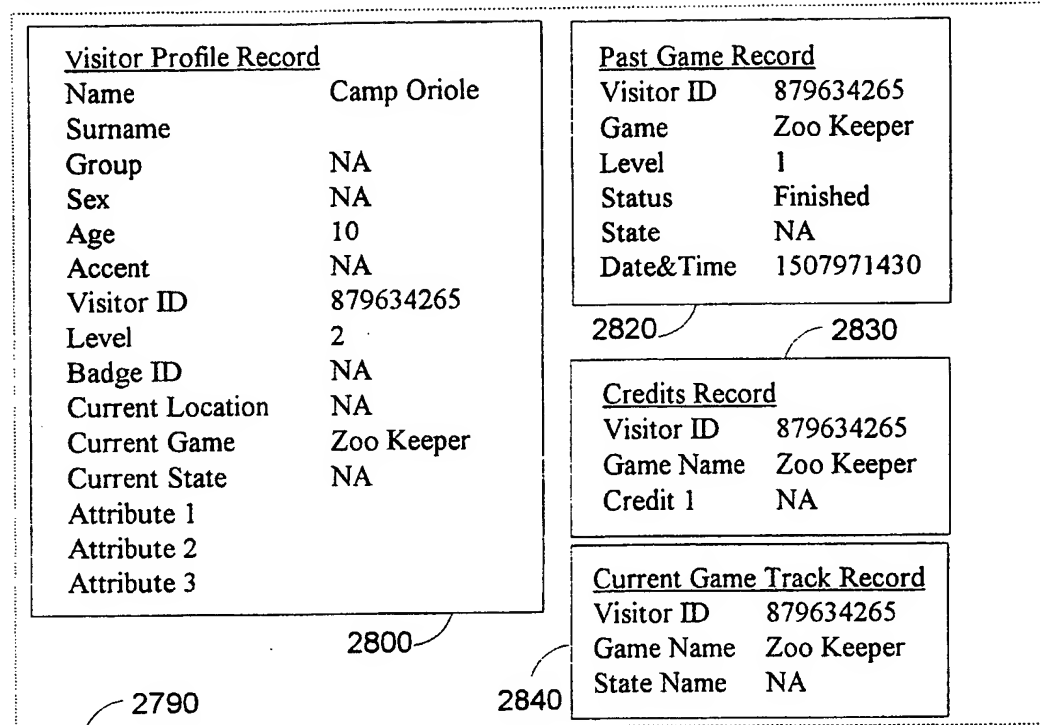


Figure 50B

147/192

| <u>Visitor Profile Record</u> |            | <u>Past Game Record</u> |           |
|-------------------------------|------------|-------------------------|-----------|
| Name                          | Dragons    | Visitor ID              | 879634267 |
| Surname                       |            | Game                    | NA        |
| Group                         | 879634265  | Level                   | NA        |
| Sex                           | NA         | Status                  | NA        |
| Age                           | 10         | State                   | NA        |
| Accent                        | NA         | Date&Time               | NA        |
| Visitor ID                    | 879634267  |                         |           |
| Level                         | 2          |                         |           |
| Badge ID                      | NA         |                         |           |
| Current Location              | NA         |                         |           |
| Current Game                  | Zoo Keeper |                         |           |
| Current State                 | NA         |                         |           |
| Attribute 1                   |            |                         |           |
| Attribute 2                   |            |                         |           |
| Attribute 3                   |            |                         |           |

2790 2800 2840 2720 2830

| <u>Credits Record</u> |            |
|-----------------------|------------|
| Visitor ID            | 879634267  |
| Game Name             | Zoo Keeper |
| Credit 1              | Bear fed   |

| <u>Current Game Track Record</u> |            |
|----------------------------------|------------|
| Visitor ID                       | 879634267  |
| Game Name                        | Zoo Keeper |
| State Name                       | NA         |

| <u>Visitor Profile Record</u> |            | <u>Past Game Record</u> |            |
|-------------------------------|------------|-------------------------|------------|
| Name                          | Tony       | Visitor ID              | 879634271  |
| Surname                       | Dunn       | Game                    | Zoo Keeper |
| Group                         | A Team     | Level                   | 1          |
| Sex                           | NA         | Status                  | Finished   |
| Age                           | 10         | State                   | NA         |
| Accent                        | NA         | Date&Time               | 1507971430 |
| Visitor ID                    | 879634271  |                         |            |
| Level                         | 2          |                         |            |
| Badge ID                      | 2555       |                         |            |
| Current Location              | Bear 12    |                         |            |
| Current Game                  | Zoo Keeper |                         |            |
| Current State                 | Feed Bear  |                         |            |
| Attribute 1                   |            |                         |            |
| Attribute 2                   |            |                         |            |
| Attribute 3                   |            |                         |            |

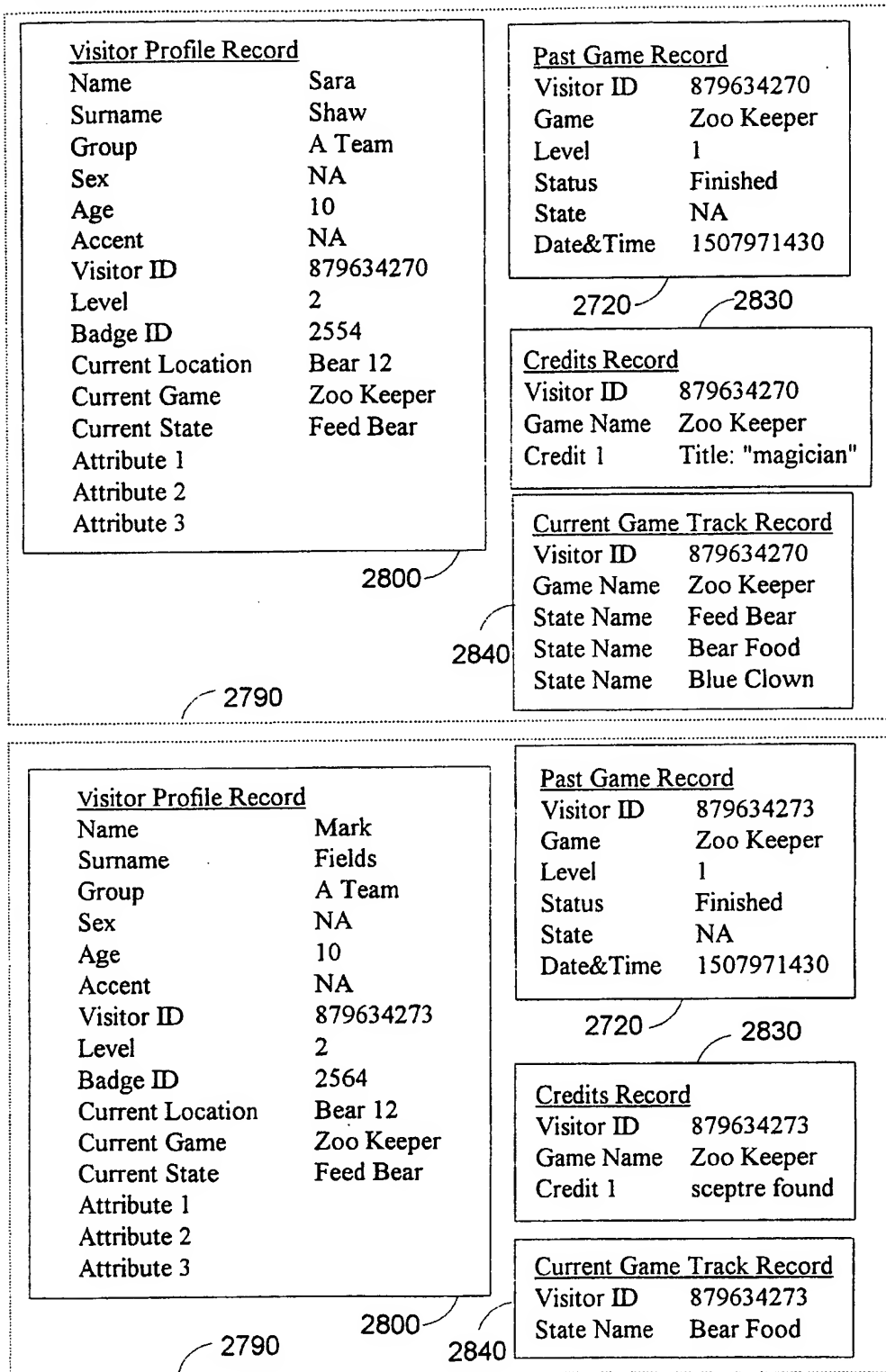
2790 2800 2840 2720 2830

| <u>Credits Record</u> |                |
|-----------------------|----------------|
| Visitor ID            | 879634271      |
| Game Name             | Zoo Keeper     |
| Credit 1              | gold key found |
| Credit 2              | cash \$75      |

| <u>Current Game Track Record</u> |            |
|----------------------------------|------------|
| Visitor ID                       | 879634271  |
| Game Name                        | Zoo Keeper |
| State Name                       | Bear Food  |

Figure 50C

148/192



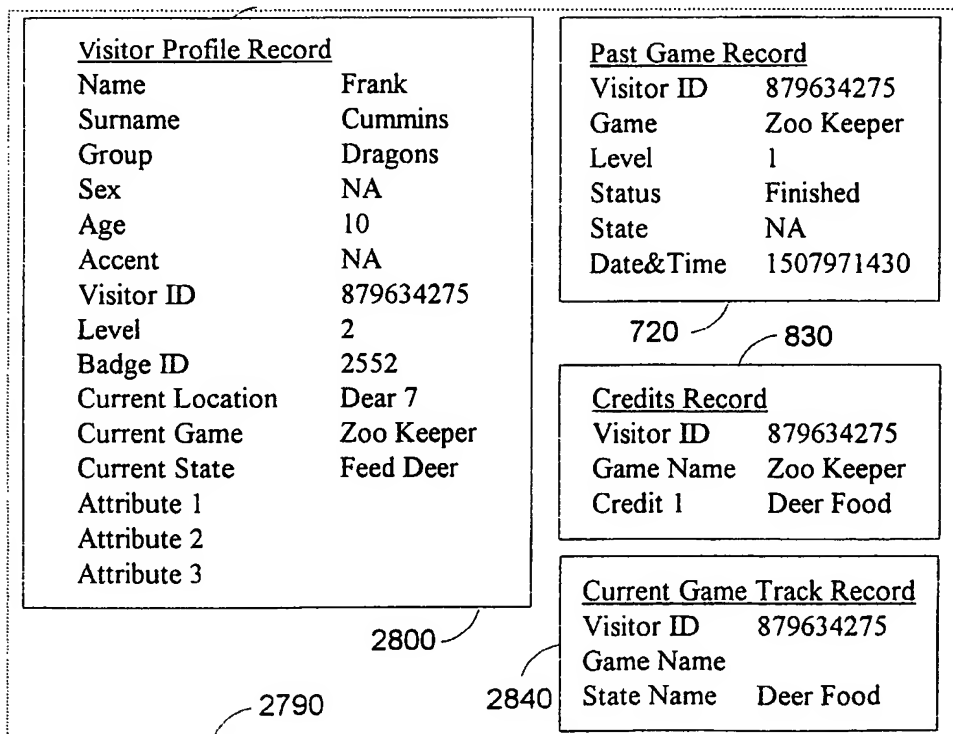
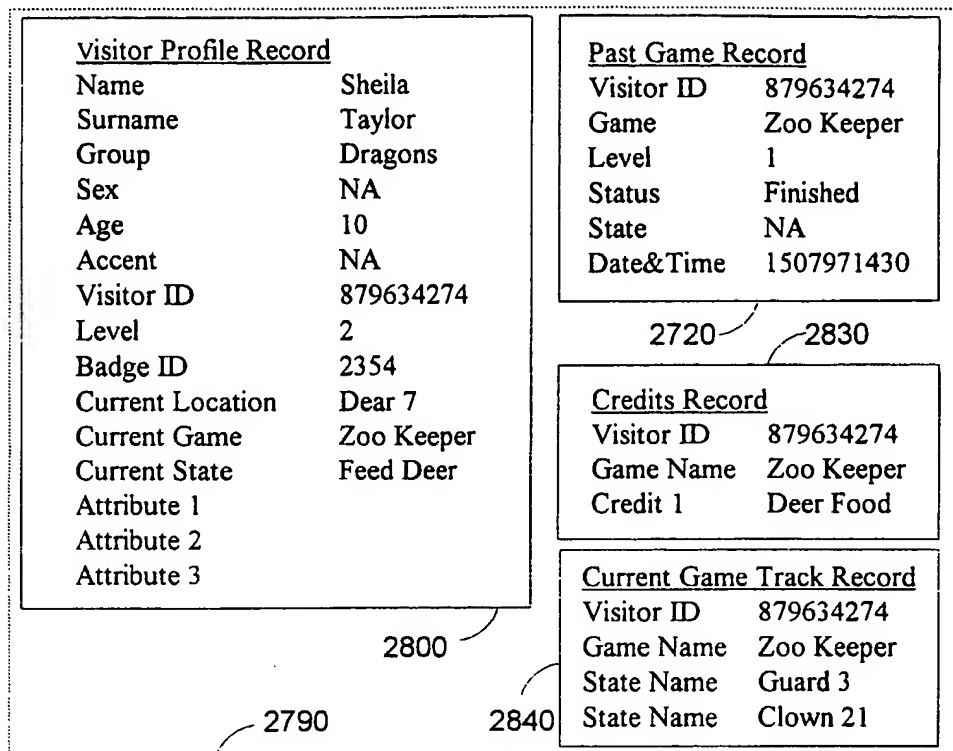
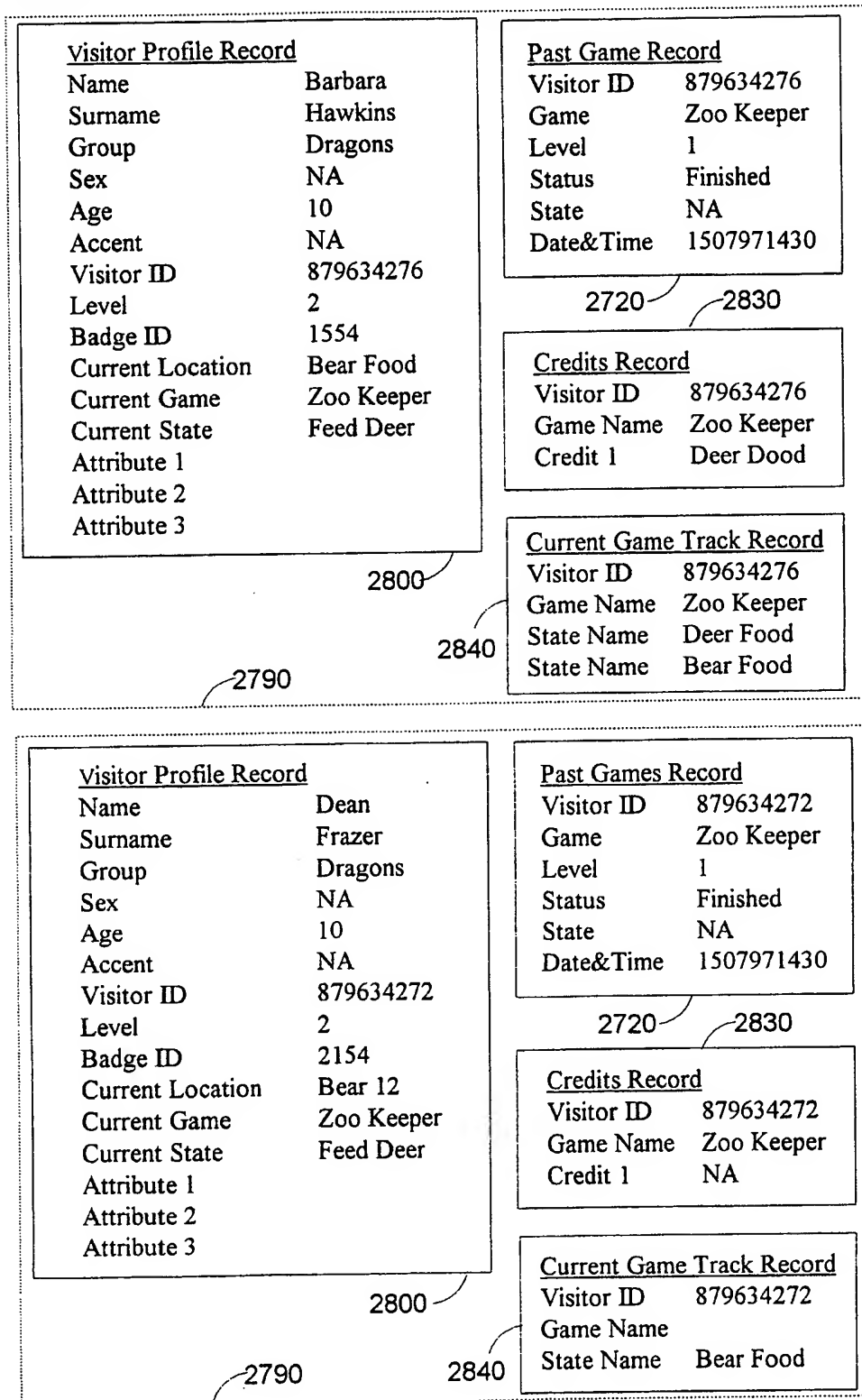
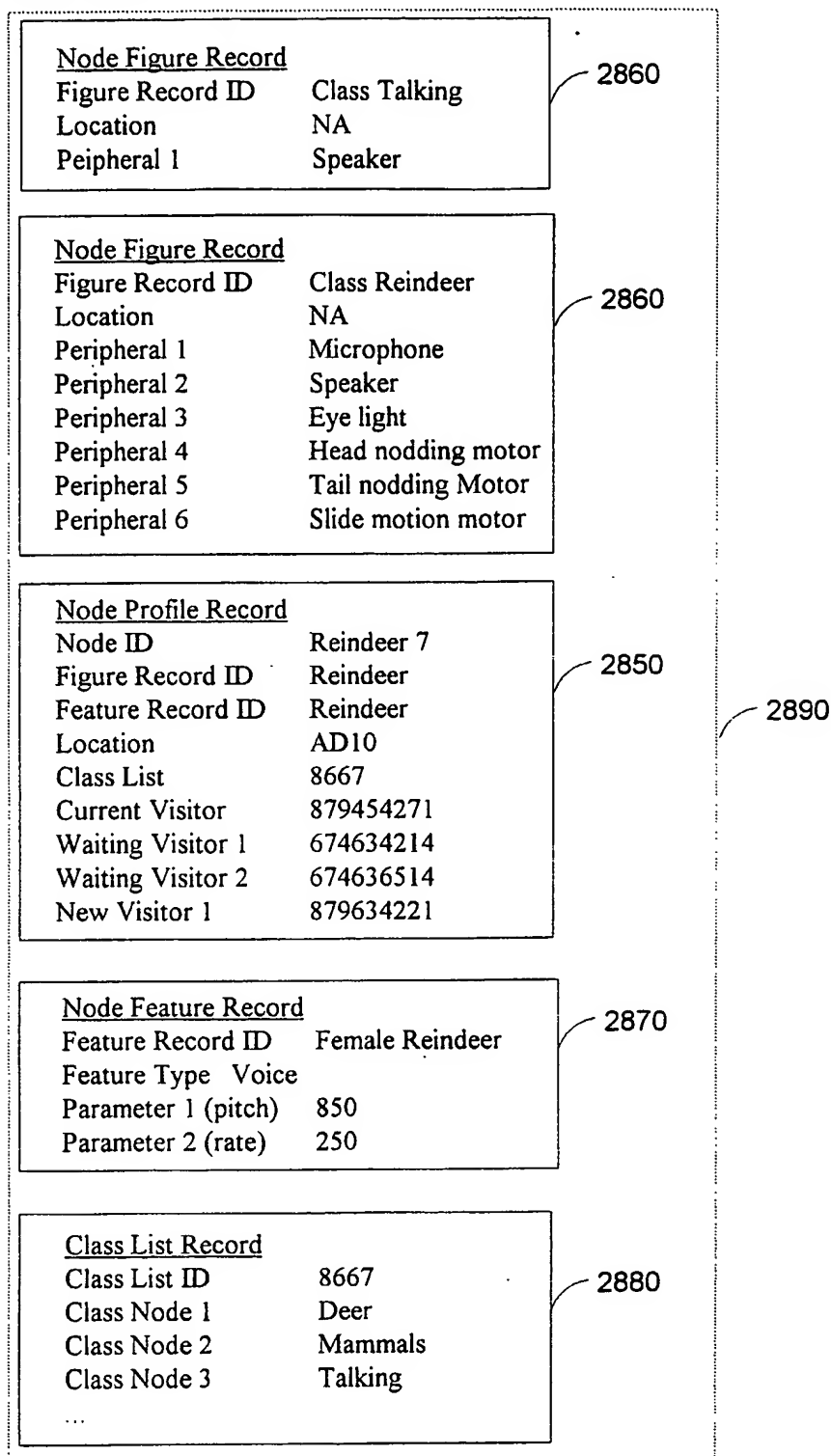
**Figure 50D****149/192**

Figure 50E

150/192





**Figure 51****151/192**

**Figure 52****152/192**

| <u>Game State Record</u> |                                                                                                                                                        |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Game Name                | Zoo Keeper                                                                                                                                             |
| State Name               | Feed Bear                                                                                                                                              |
| Node Name                | Class Bear A                                                                                                                                           |
| Condition Set 1          | Visitor.Credit = Deer Fed and<br>Visitor.Credit = Bear Food                                                                                            |
| Condition Set 2          | Visitor.Credit = Bear Food                                                                                                                             |
| Condition Set 3          | Group.Credit = Deer Fed<br>Visitor.Credit = Bear Food                                                                                                  |
| Condition Set 4          | Default                                                                                                                                                |
| Action Set 1             | Play "Thank you very much for this delicious meal"<br>Play "I will tell you a secret, the gun store has<br>something to help you pass the lions' gate" |
| Action Set 2             | Play "Thank you very much for this delicious meal"<br>Play "I will tell you a secret, I have heard that<br>my dear friend is still hungry"             |
| Action Set 3             | Play "Thank you very much for this delicious meal"<br>Play "I will tell you a secret, a sad clown knows<br>your way"                                   |
| Action Set 4             | Play "It's fishy, very fishy, go feed a fish eater"                                                                                                    |
| Transition 1             | Gun Store                                                                                                                                              |
| Transition 2             | Deer Food                                                                                                                                              |
| Transition 3             | Blue Clown                                                                                                                                             |
| Transition 4             | Bear Feeding                                                                                                                                           |

2810

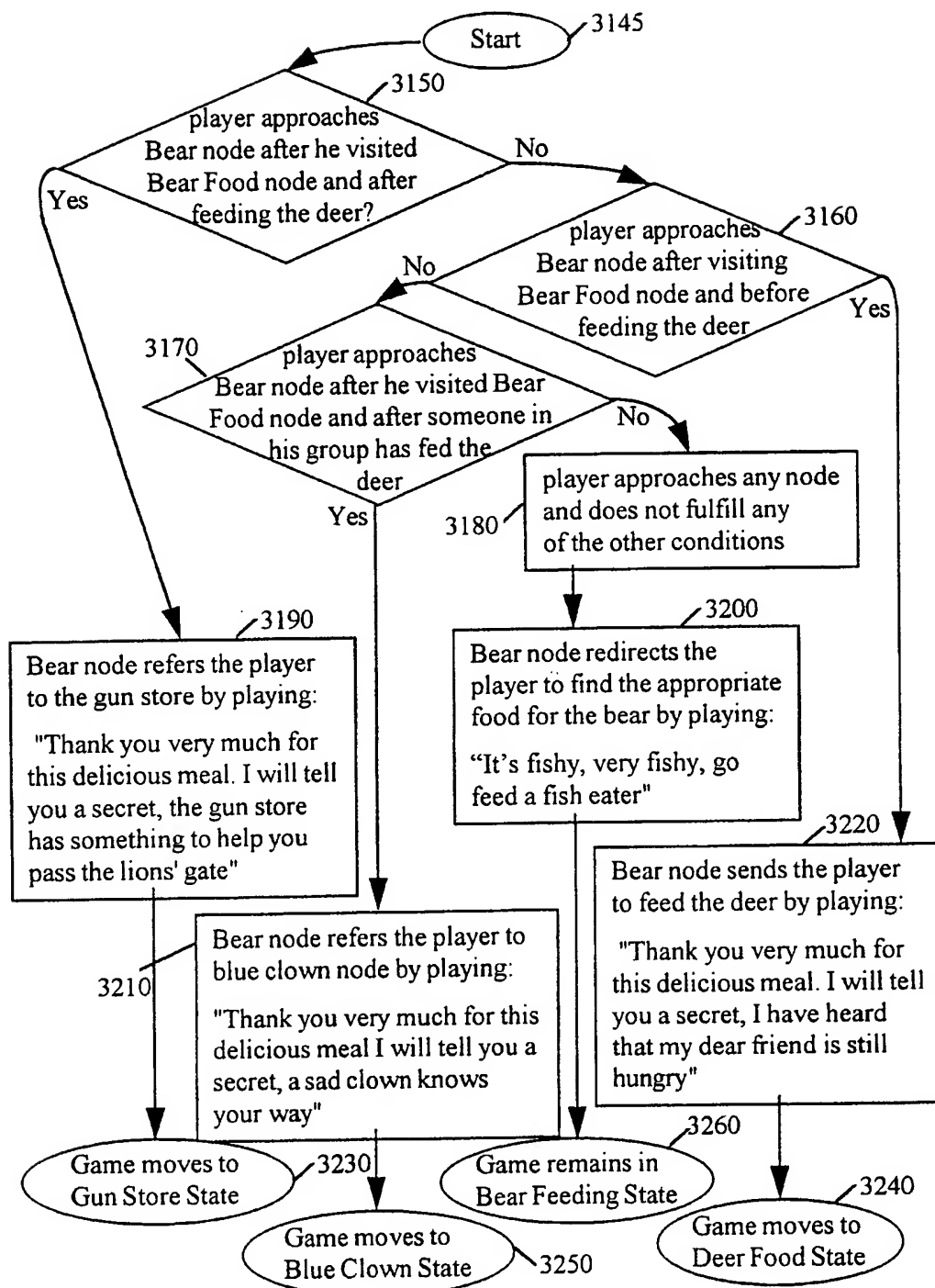
**Figure 53****153/192**

2810

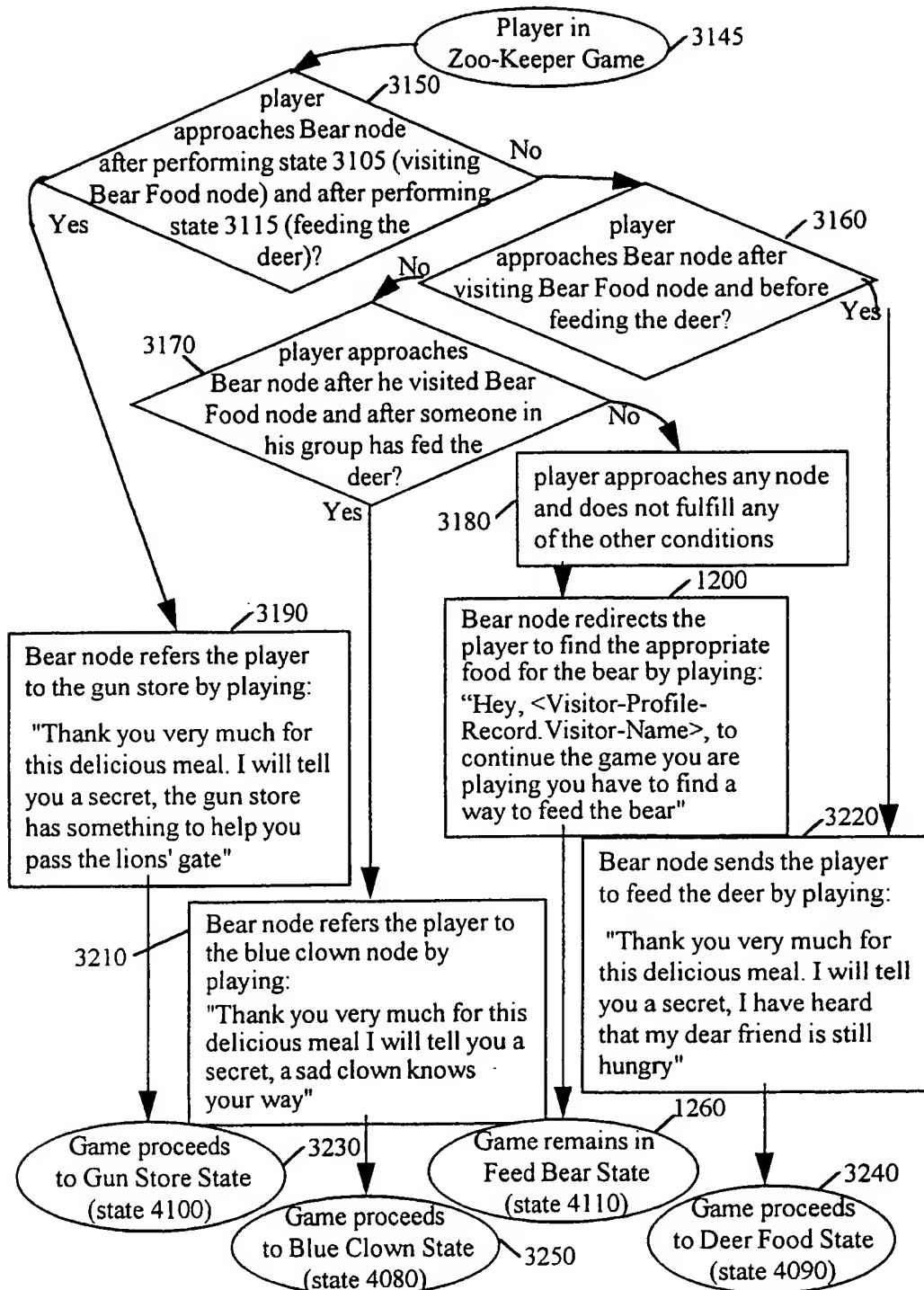
Game State Record

|                 |                                                                                                                                                   |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Game Name       | Zoo Keeper                                                                                                                                        |
| State Name      | Feed Deer                                                                                                                                         |
| Node Name       | Class Deer                                                                                                                                        |
| Condition Set 1 | Credit = Bear Fed                                                                                                                                 |
| Condition Set 2 | Credit = Blue Clown                                                                                                                               |
| Condition Set 3 | Group.Credit = Deer Fed                                                                                                                           |
| Condition Set 4 | Default                                                                                                                                           |
| Action Set 1    | Play "Thank you very much for this delicious meal"<br>Play "I will tell you a secret, the red clown knows<br>how to pass the lions' gate"         |
| Action Set 2    | Play "Thank you very much for this delicious meal"<br>Play "I will tell you a secret, The jockeys will not<br>start the race on an empty stomach" |
| Action Set 3    | Play "Thank you very much for this delicious meal"<br>Play "I will tell you a secret, a sad clown knows<br>your way"                              |
| Action Set 4    | Play "Sound the horns, send the dogs,"                                                                                                            |
| Transition 1    | Red Clown                                                                                                                                         |
| Transition 2    | Horse Food                                                                                                                                        |
| Transition 3    | Blue Clown                                                                                                                                        |
| Transition 4    | Feed Bear                                                                                                                                         |

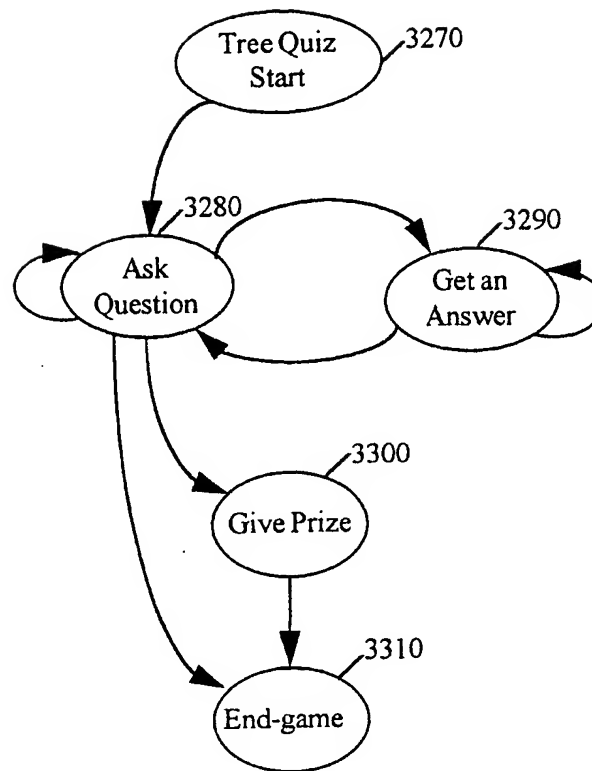
154/192  
Figure 54A



155/192  
Figure 54B



**156/192**  
Figure 55



**Figure 56A****157/192**

2810

**Game State Record**

|                 |                                                                                                                                                                                    |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Game Name       | Tree-Quiz                                                                                                                                                                          |
| State Name      | Ask Question                                                                                                                                                                       |
| Node Name       | Class Tree                                                                                                                                                                         |
| Condition Set 1 | Visitor.History.Game-Name = Tree-Quiz and<br>Visitor.Credits = Tree-Quiz                                                                                                           |
| Condition Set 2 | Visitor.History.Game-Name = Not(Tree-Quiz)                                                                                                                                         |
| Condition Set 3 | Visitor.History.Game-Name = Tree-Quiz and<br>Visitor.Credits = Not(Tree-Quiz) and<br>Visitor.Level < 3 and<br>Local-Parameter-2 = Answer (Local-Parameter-1)                       |
| Condition Set 4 | Visitor.History.Game-Name = Tree-Quiz and<br>Visitor.Credits = Not(Tree-Quiz) and<br>Visitor.Level => 3 and<br>Local-Parameter-2 = Answer (Local-Parameter-1)                      |
| Condition Set 5 | Visitor.History.Game-Name = Tree-Quiz and<br>Visitor.Credits = Not(Tree-Quiz) and (<br>Local-Parameter-2 = Not (Answer (Local-Parameter-1)) or<br>Local-Parameter-2 = No-Response) |
| Condition Set 6 | Visitor.History.Game-Name = Tree-Quiz and<br>Visitor.Credits = Not(Tree-Quiz) and (<br>Local-Parameter-2 = Not (Answer (Local-Parameter-1)) or<br>Local-Parameter-2 = No-Response) |
| Condition Set 7 | Visitor.Level = 0<br>Default                                                                                                                                                       |

**Figure 56B****158/192**

|              |                                                                                                                                                                                                                                |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | (Continued)                                                                                                                                                                                                                    |
| Action Set 1 | Play" <Visitor.Visitor-Name>, please proceed to another node."                                                                                                                                                                 |
| Action Set 2 | Set Visitor.Game-Name = Tree-Quiz<br>Play "Hello <visitor.visitor-name>"<br>Select Question =<br>Tree-Quiz.(Visitor.Age)(visitor.Level)(Random-Number)<br>Set <Local-Parameter-1> = Question<br>Play Question                  |
| Action Set 3 | Play "Correct answer <visitor.visitor-name>,<br>please proceed to the clown to receive your prize"<br>Set Visitor.Attribute-3 = Gift(Tree-Quiz)<br>Set Visitor.Attribute-4 = 0                                                 |
| Action Set 4 | Play "Correct answer <visitor.visitor-name>,<br>to receive your prize you must visit the red clown in<br>thirty minutes, good luck."<br>Set Visitor.Attribute-3 = Gift(Tree-Quiz)<br>Set Visitor.Attribute-4 = Time(Time + 30) |
| Action Set 5 | Play "Sorry <visitor.visitor-name>, but the correct answer is<br><answer(Local-Parameter-1)>."<br>decrement Visitor.Level                                                                                                      |
| Action Set 6 | Play "Thank you <visitor.visitor-name> for your participation,<br>please proceed to another node"                                                                                                                              |
| Action Set 7 | None                                                                                                                                                                                                                           |
| Transition 1 | End Game                                                                                                                                                                                                                       |
| Transition 2 | Record Answer                                                                                                                                                                                                                  |
| Transition 3 | End-Game                                                                                                                                                                                                                       |
| Transition 4 | End-Game                                                                                                                                                                                                                       |
| Transition 5 | Self                                                                                                                                                                                                                           |
| Transition 6 | End Game                                                                                                                                                                                                                       |
| Transition 7 | State Default                                                                                                                                                                                                                  |



Figure 56C

159/192

|              |                                                                                                                                                                                                                    |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | (Continued)                                                                                                                                                                                                        |
| Action Set 1 | Play" <Visitor.Visitor-Name>, please proceed to another game."                                                                                                                                                     |
| Action Set 2 | Set Visitor.Game-Name = Tree-Quiz<br>Play "Hello <visitor.visitor-name>"<br>Select Question =<br>Tree-Quiz.(Visitor.Age)(visitor.Level)(Random-Number)<br>Set <Local-Parameter-1> = Question<br>Play Question      |
| Action Set 3 | Play "Correct answer <visitor.visitor-name>,<br>please proceed to the clown to receive your prize"<br>Increment Visitor.Attribute-3<br>Set Visitor.Attribute-4 = 0                                                 |
| Action Set 4 | Play "Correct answer <visitor.visitor-name>,<br>to receive your prize you must visit the red clown in<br>thirty minutes, good luck."<br>Increment Visitor.Attribute-3<br>Set Visitor.Attribute-4 = Time(Time + 30) |
| Action Set 5 | Play "Sorry <visitor.visitor-name>, but the correct answer is<br><answer(Local-Parameter-1)>."<br>decrement Visitor.Level                                                                                          |
| Action Set 6 | Play "Thank you <visitor.visitor-name> for your participation,<br>please proceed to the clown to receive your prize"<br>Decrement Visitor.Attribute-3                                                              |
| Action Set 7 | None                                                                                                                                                                                                               |
| Transition 1 | End Game                                                                                                                                                                                                           |
| Transition 2 | Record Answer                                                                                                                                                                                                      |
| Transition 3 | End-Game                                                                                                                                                                                                           |
| Transition 4 | End-Game                                                                                                                                                                                                           |
| Transition 5 | Self                                                                                                                                                                                                               |
| Transition 6 | End Game                                                                                                                                                                                                           |
| Transition 7 | State Default                                                                                                                                                                                                      |

**Figure 57****160/192**

- 2810

**Game State Record**

|                 |                                                                                                       |
|-----------------|-------------------------------------------------------------------------------------------------------|
| Game Name       | Tree Quiz                                                                                             |
| State Name      | Record Answer                                                                                         |
| Node Name       | Class Tree                                                                                            |
| Condition Set 1 | Local-Parameter-3 = Not Recording                                                                     |
| Condition Set 2 | Local-Parameter-3 = Recording and<br>Silence greater than 5 seconds and no voice                      |
| Condition Set 2 | Local-Parameter-3 = Recording and<br>Silence greater than 5 seconds and voice                         |
| Condition Set 3 | Local-Parameter-3 = Recording and<br>Voice and no silence                                             |
| Action Set 1    | Start Recording<br>Set Local-Parameter-3 = Recording(Local-Parameter-2)                               |
| Action Set 2    | Set Local-Parameter-2 = No-Response<br>Set Local-Parameter-3 = Not Recording                          |
| Action Set 3    | Set Local-Parameter-2 = Voice-recognition(local-Parameter-2)<br>Set Local-Parameter-3 = Not Recording |
| Action Set 4    | None                                                                                                  |
| Transition 1    | Self                                                                                                  |
| Transition 2    | Ask-Question                                                                                          |
| Transition 3    | Ask-Question                                                                                          |
| Transition 4    | Self                                                                                                  |

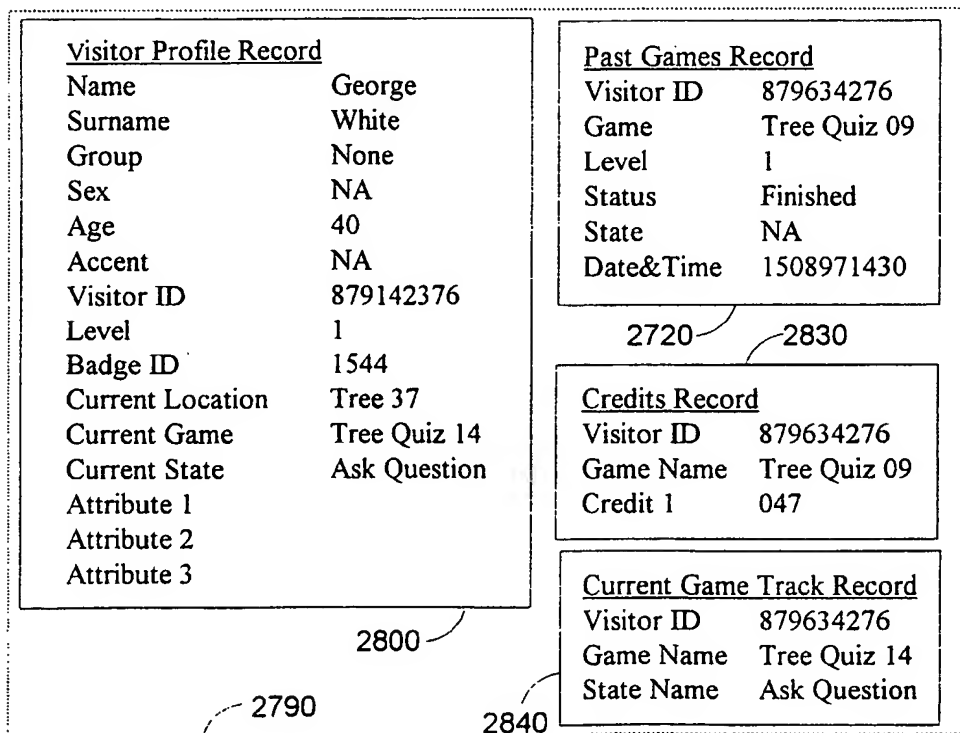
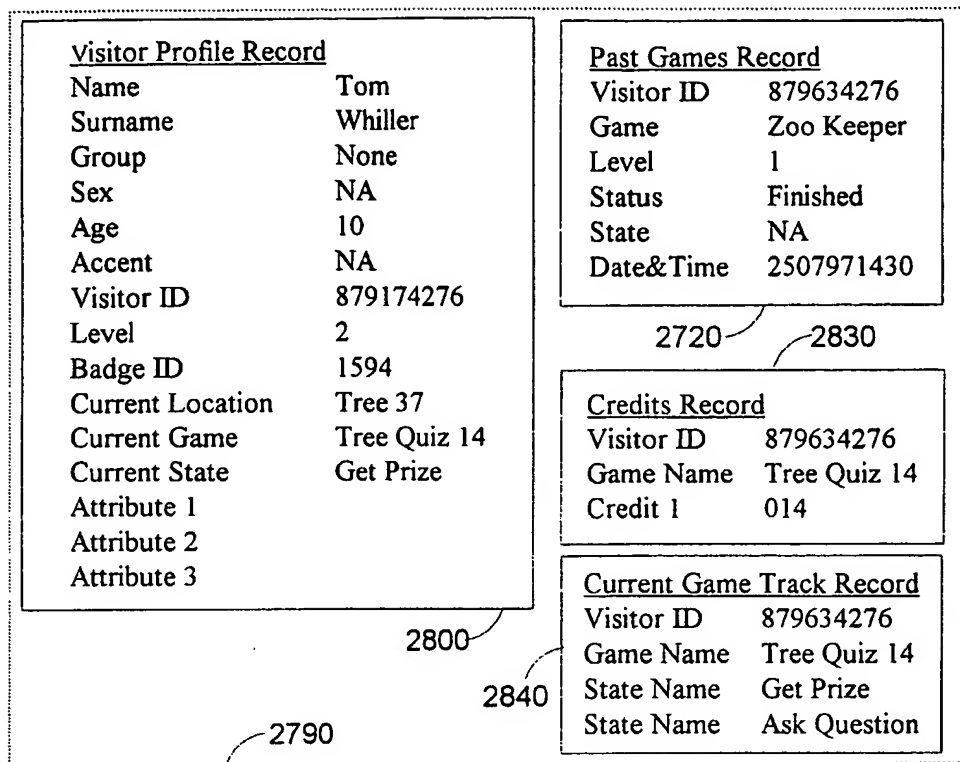
2810

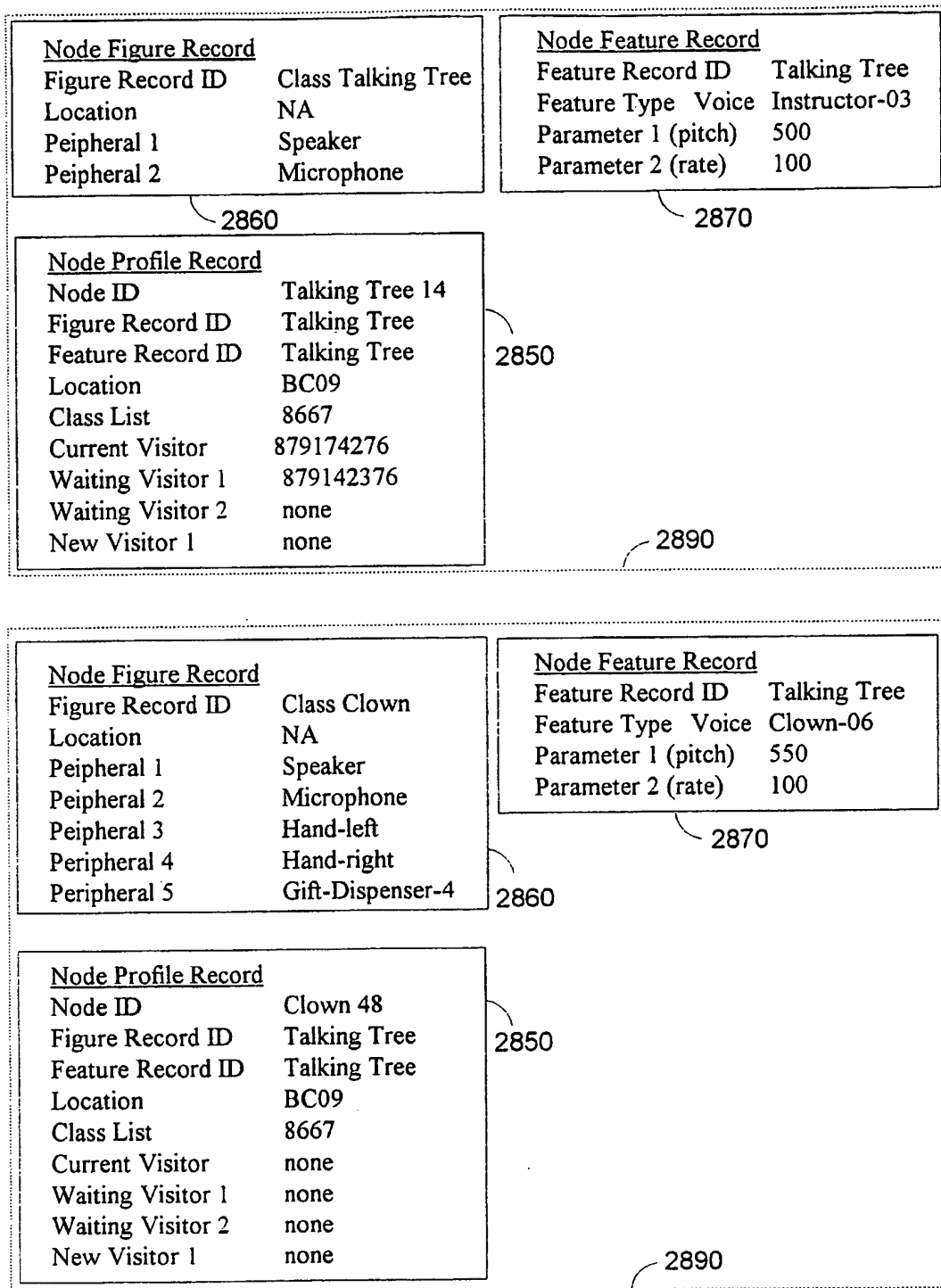
**Game State Record**

|                 |                                                                                                                       |
|-----------------|-----------------------------------------------------------------------------------------------------------------------|
| Game Name       | Any-Game                                                                                                              |
| State Name      | Give-Present                                                                                                          |
| Node Name       | Clown                                                                                                                 |
| Condition Set 1 | Visitor.Attribute-3 = Not Gift                                                                                        |
| Condition Set 1 | Visitor.Attribute-3 = Gift                                                                                            |
| Action Set 1    | Play "Hi <Visitor.Visito-Name>, please go and try a quiz"                                                             |
| Action Set 2    | Play "Hi <Visitor.Visito-Name>, here is your present"<br>Dispense (Visitor.Attribute)<br>Set Visitor.Attribute = None |
| Transition 1    | End Game                                                                                                              |
| Transition 2    | End Game                                                                                                              |

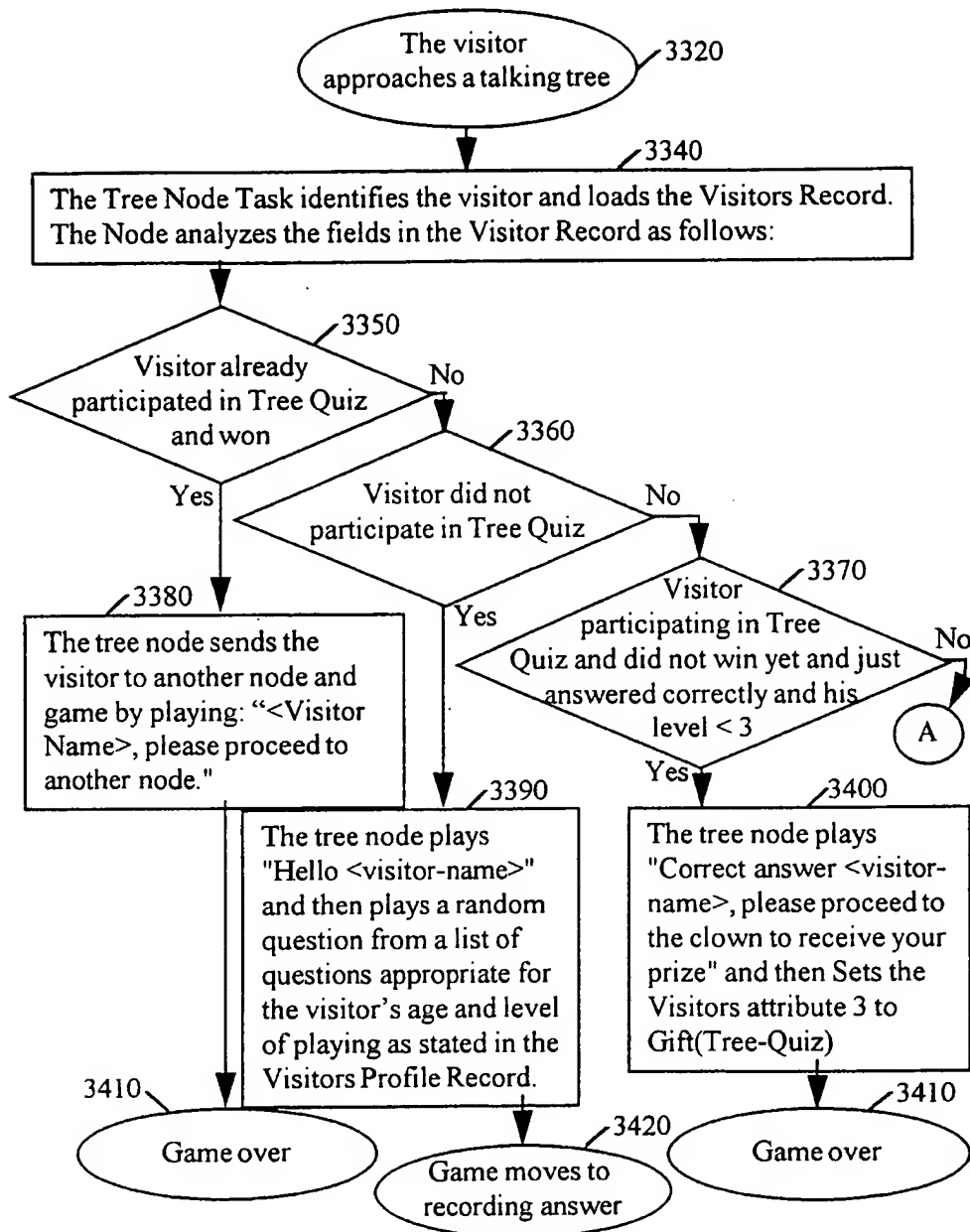
Figure 58

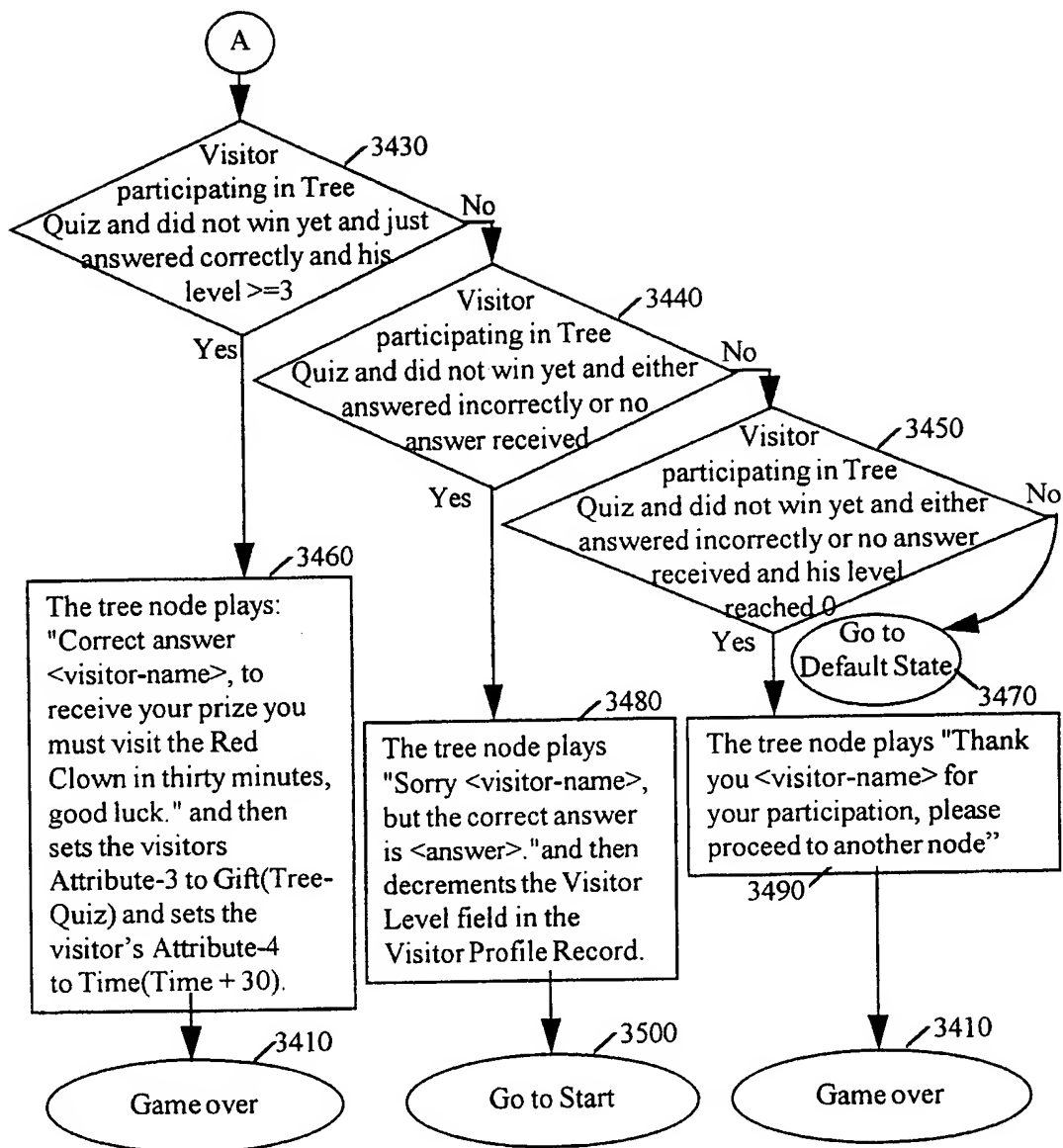
161/192



**Figure 59****162/192**

163/192  
Figure 60A



164/192  
Figure 60B

165/192  
Figure 61

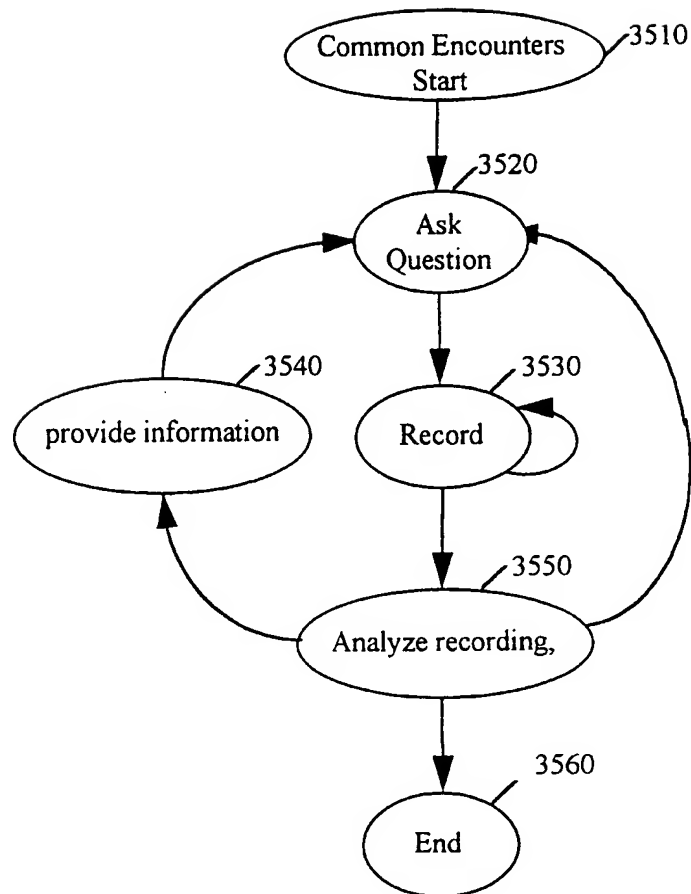


Figure 62

166/192

2790

| <u>Game State Record</u> |                                                                                                                                                                                                                                                                                                                   |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Game Name                | Common Encounters                                                                                                                                                                                                                                                                                                 |
| State Name               | Ask Question                                                                                                                                                                                                                                                                                                      |
| Node Name                | Class All                                                                                                                                                                                                                                                                                                         |
| Condition Set 1          | Local-Parameter-1 = Start                                                                                                                                                                                                                                                                                         |
| Condition Set 2          | Local-Parameter-1 = Yes-No                                                                                                                                                                                                                                                                                        |
| Condition Set 3          | Local-Parameter-1 = Refine                                                                                                                                                                                                                                                                                        |
| Condition Set 4          | Local-Parameter-3 = "no keywords spotted"                                                                                                                                                                                                                                                                         |
| Condition Set 5          | No visitor                                                                                                                                                                                                                                                                                                        |
| Condition Set 6          | Default                                                                                                                                                                                                                                                                                                           |
| Action Set 1             | Play: "You are playing the <Visitor-Record.Game-Name><br>game. You are now in the < Visitor-Record. Current State><br>state. You should approach <Game-Name.Node name>".<br>Play: "How can I help you further?"<br>Set Local-Parameter-2 = 30<br>Set Local-Parameter-3 = Analyze<br>Set Local-Parameter-4 = blank |
| Action Set 2             | Play: "Does this help you?"<br>Set Local-Parameter-2 = 5<br>Set Local-Parameter-3 = Analyze<br>Set Local-Parameter-4 = Yes-No                                                                                                                                                                                     |
| Action Set 3             | Play: "How can I help you further?"<br>Set Local-Parameter-2 = 30<br>Set Local-Parameter-3 = Analyze<br>Set Local-Parameter-4 = blank                                                                                                                                                                             |
| Action Set 4             | Play: "Please rephrase your question"                                                                                                                                                                                                                                                                             |
| Action Set 5             | None                                                                                                                                                                                                                                                                                                              |
| Action Set 6             | None                                                                                                                                                                                                                                                                                                              |
| Transition 1             | Record                                                                                                                                                                                                                                                                                                            |
| Transition 2             | Record                                                                                                                                                                                                                                                                                                            |
| Transition 3             | Record                                                                                                                                                                                                                                                                                                            |
| Transition 4             | Record                                                                                                                                                                                                                                                                                                            |
| Transition 5             | End-Game                                                                                                                                                                                                                                                                                                          |
| Transition 6             | Alarm Operating Center                                                                                                                                                                                                                                                                                            |



**Figure 63A**

167/192

2790

| <b><u>Game State Record</u></b> |                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Game Name                       | Common Encounters                                                                                                                                            |
| State Name                      | Analyze                                                                                                                                                      |
| Node Name                       | Class All                                                                                                                                                    |
| Condition Set 1                 | Local-Parameter-4 = "Yes-No"                                                                                                                                 |
| Condition Set 2                 | Local-Parameter-3 = "Yes"                                                                                                                                    |
| Condition Set 3                 | Local-Parameter-3 = "No"                                                                                                                                     |
| Condition Set 4                 | Local-Parameter-3 = blank                                                                                                                                    |
| Condition Set 5                 | Local-Parameter-3 = "no keywords spotted"                                                                                                                    |
| Condition Set 6                 | none                                                                                                                                                         |
| Action Set 1                    | Set Local-Parameter-3 = "Yes;No"<br>Word-spot(Local-Parameter-2,Local-Parameter-3,<br>Local-Parameter-3)                                                     |
| Action Set 2                    | None                                                                                                                                                         |
| Action Set 3                    | Set Local-Parameter-1= Refine                                                                                                                                |
| Action Set 4                    | Local-Parameter-3 = "no keywords spotted"<br>Speech-recognition(Local-Parameter-2,Local-Parameter-3,)                                                        |
| Action Set 5                    | None                                                                                                                                                         |
| Action Set 6                    | Append(Local-Parameter-5,Local-Parameter-3)<br>Set Local-Parameter-5 = Local-Parameter-3<br>Compute-weight(Local-Parameter-3,FAQ(all),<br>Local-Parameter-3) |
| Transition 1                    | Self                                                                                                                                                         |
| Transition 2                    | End                                                                                                                                                          |
| Transition 3                    | Ask Question                                                                                                                                                 |
| Transition 4                    | Self                                                                                                                                                         |
| Transition 5                    | Ask Question                                                                                                                                                 |
| Transition 6                    | Provide-Information                                                                                                                                          |

**Figure 63B****168/192**

2790

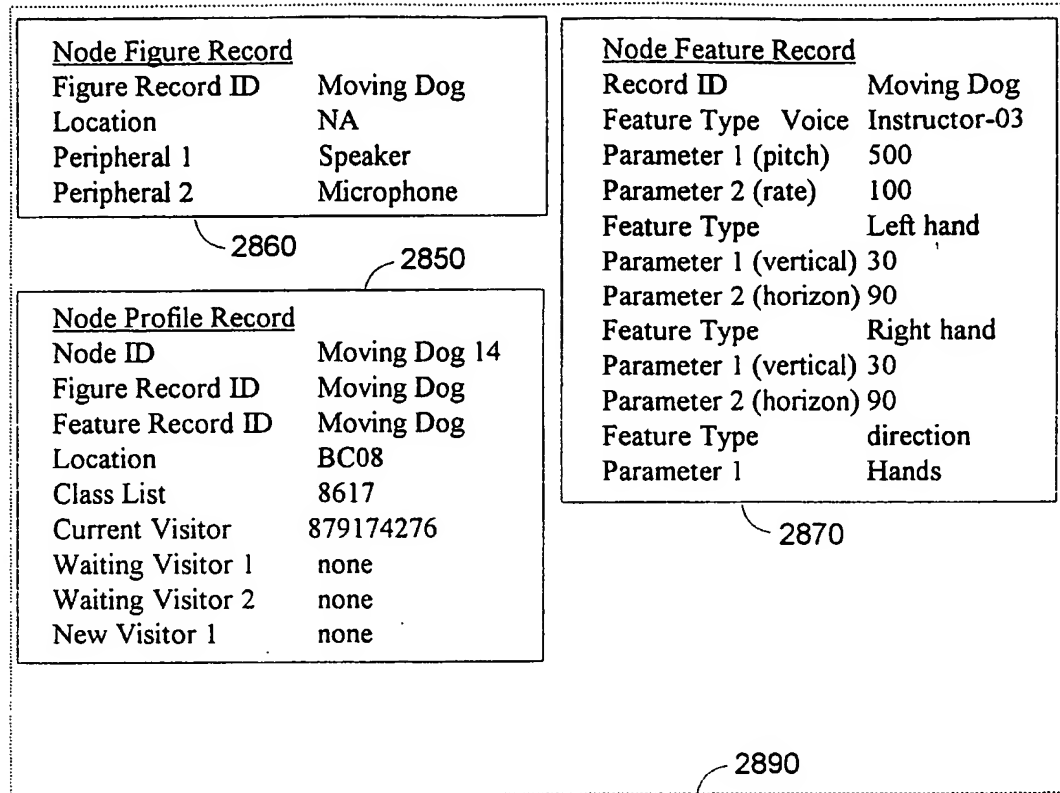
**Game State Record**

|                 |                                                          |
|-----------------|----------------------------------------------------------|
| Game Name       | Common Encounters                                        |
| State Name      | Provide-Information                                      |
| Node Name       | Class All                                                |
| Condition Set 1 | Local-Parameter-3 = not blank and                        |
| Condition Set 2 | Local-Parameter-3 = blank                                |
| Action Set 1    | Local-Parameter-2 = Local-Parameter-3.Number-Expressions |
|                 | Loop(Local-parameter-2 > 0)                              |
|                 | Load-Expression (Local-Parameter-3, Local-Parameter-2)   |
|                 | Decrement (Local-Parameter-2)                            |
|                 | End-Loop                                                 |
|                 | Perform Expressions                                      |
|                 | Play (Local-Parameter-3.Play-File-Pointer)               |
|                 | Set Local-Parameter-1 = refine                           |
| Action Set 2    | Set Local-Parameter-1 = start                            |
| Transition 1    | Ask-Question                                             |
| Transition 2    | Ask-Question                                             |

2790

**Game State Record**

|                 |                                             |
|-----------------|---------------------------------------------|
| Game Name       | Common Encounters                           |
| State Name      | Record                                      |
| Node Name       | Class All                                   |
| Condition Set 1 | Local-Parameter-2 > 0                       |
| Condition Set 2 | Local-Parameter-2 = 0                       |
| Action Set 1    | Record (Local-Parameter-2)                  |
| Action Set 2    | Set Local-Parameter-2 = Record File Pointer |
| Transition 1    | Self                                        |
| Transition 1    | Local-Parameter-3                           |

**Figure 64****169/192**

**Figure 65A**

2900

170/192

Play Record

|                         |                                                                                             |
|-------------------------|---------------------------------------------------------------------------------------------|
| Play Name               | Restrooms Direction                                                                         |
| Pre Play Processing     | Calculate-Direction                                                                         |
| Post Play Processing    | none                                                                                        |
| Play List               | Play Direction                                                                              |
| Number Parameters       | 6                                                                                           |
| Parameter-1             | Node-Profile-Record.Location                                                                |
| Parameter-2             | Restrooms                                                                                   |
| Parameter-3             | (relative distance)                                                                         |
| Parameter-4             | (relative angle)                                                                            |
| Parameter-5             | (relative position front/behind)                                                            |
| Parameter-6             | (relative position right/left)                                                              |
| Calculate-Direction     |                                                                                             |
| Begin                   | Direction (Parameter-1, Parameter-2, Parameter-3,<br>Parameter-4, Parameter-5, Parameter-6) |
| End Calculate-Direction |                                                                                             |
| Play Direction          |                                                                                             |
| Play List type          | Assembled Recording                                                                         |
| Number of Play Elements | 5                                                                                           |
| Play File Pointer       | VR03025.WAV                                                                                 |
| Play File Element       | Play Front                                                                                  |
| Play File Element       | Play Back                                                                                   |
| Play File Element       | Play Right                                                                                  |
| Play File Element       | Play Left                                                                                   |
| Play Front              |                                                                                             |
| Play file type          | Conditional                                                                                 |
| Number of Parameters    | 2                                                                                           |
| Condition               | Parameter-5 = 1                                                                             |
| Play File Pointer       | VR03120.WAV                                                                                 |
| Play Behind             |                                                                                             |
| Play file type          | Conditional                                                                                 |
| Number of Parameters    | 2                                                                                           |
| Condition               | Parameter-5 = -1                                                                            |
| Play File Pointer       | VR03121.WAV                                                                                 |
| Play Right              |                                                                                             |
| Play file type          | Conditional                                                                                 |
| Number of Parameters    | 2                                                                                           |
| Condition               | Parameter-6 = 1                                                                             |
| Play File Pointer       | VR03122.WAV                                                                                 |
| Play Left               |                                                                                             |
| Play file type          | Conditional                                                                                 |
| Number of Parameters    | 2                                                                                           |
| Condition               | Parameter-6 = -1                                                                            |
| Play File Pointer       | VR03123.WAV                                                                                 |

**Figure 65B****171/192**

|                                |                                                                                |
|--------------------------------|--------------------------------------------------------------------------------|
| <u>Play Record (continued)</u> |                                                                                |
| Number of Expressions          | 3                                                                              |
| Expression type                | Play normal                                                                    |
| Number of Parameters           | 3                                                                              |
| Intonation                     | Normal                                                                         |
| Pitch                          | 500                                                                            |
| Rate                           | 100                                                                            |
| Expression Type                | Hand-Right                                                                     |
| Number of Parameters           | 3                                                                              |
| Condition                      | Parameter-5 = 0 and Parameter-6 = 0 or<br>Parameter-5 > -1 and Parameter 6 = 1 |
| Horizontal Angle               | Direction (Relative_Angle)                                                     |
| Vertical Angle                 | 0                                                                              |
| Expression Type                | Hand-Left                                                                      |
| Number of Parameters           | 3                                                                              |
| Condition                      | Parameter6 = -1                                                                |
| Horizontal Angle               | Direction (Relative_Angle)                                                     |
| Vertical Angle                 | 0                                                                              |

**Figure 66****172/192**

|                                |                    |
|--------------------------------|--------------------|
| <u>Frequent Inquiry Record</u> |                    |
| Answer Phrase Name             | bathroom direction |
| Number of Keywords             | 4                  |
| Keyword 1                      | bathroom           |
| Weight 1                       | 100                |
| Keyword 2                      | mensroom           |
| Weight 2                       | 100                |
| Keyword 3                      | ladiesroom         |
| Weight 3                       | 100                |
| Keyword 3                      | Toilet             |
| Weight 3                       | 100                |

2910

|                                |                   |
|--------------------------------|-------------------|
| <u>Frequent Inquiry Record</u> |                   |
| Answer Phrase Name             | bathroom cleaning |
| Number of Keywords             | 6                 |
| Keyword 1                      | bathroom          |
| Weight 1                       | 50                |
| Keyword 2                      | mensroom          |
| Weight 2                       | 50                |
| Keyword 3                      | ladiesroom        |
| Weight 3                       | 50                |
| Keyword 3                      | Toilet            |
| Weight 3                       | 50                |
| Keyword 4                      | dirty             |
| Weight 4                       | 50                |
| Keyword 4                      | filthy            |
| Weight 4                       | 50                |

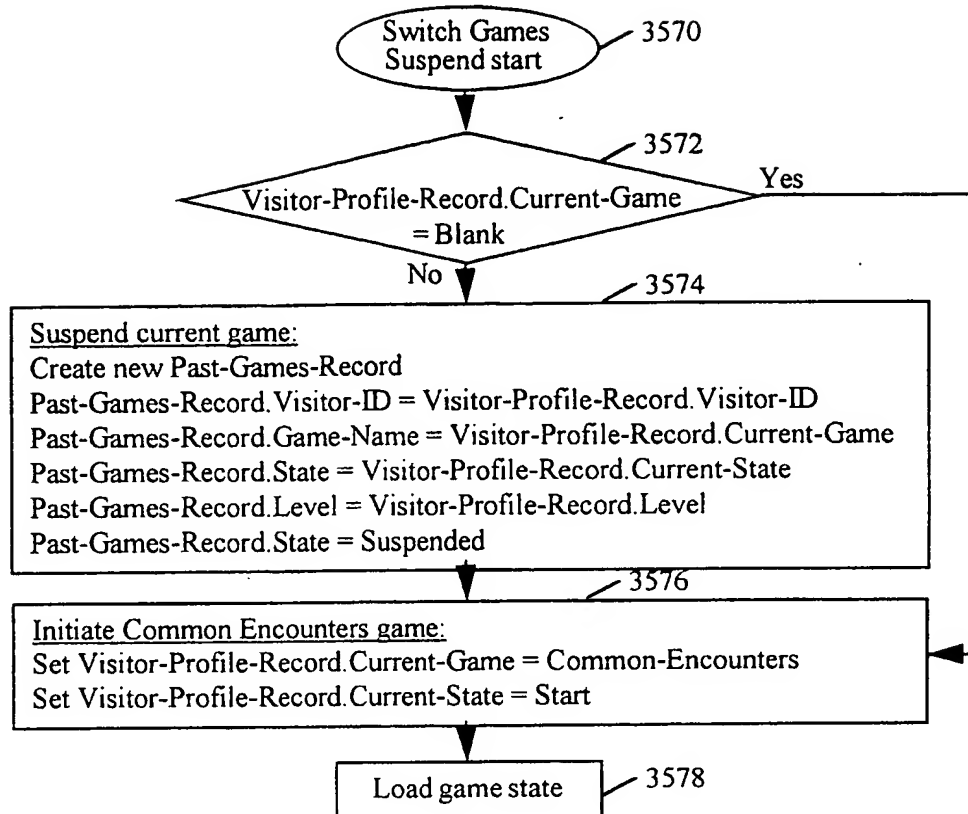
2910

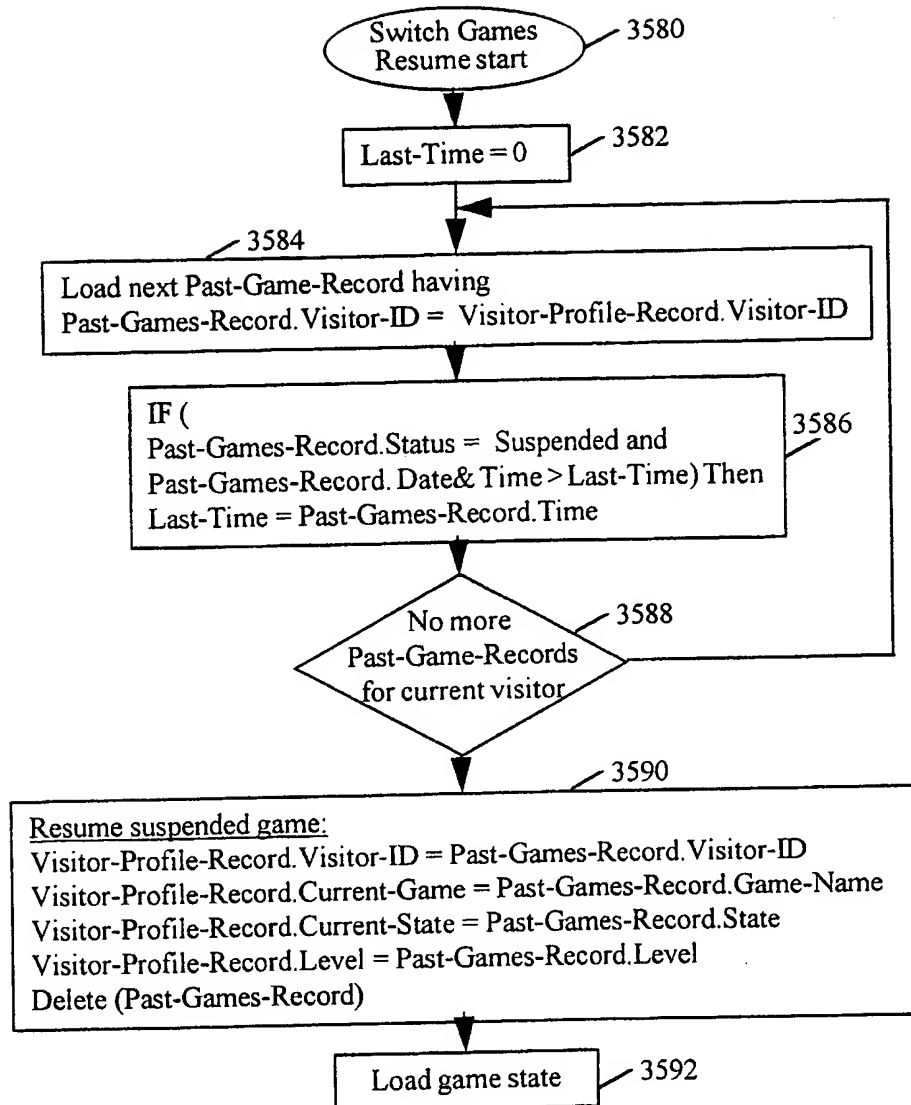
|                        |                    |
|------------------------|--------------------|
| <u>Temporary Table</u> |                    |
| Number of Phrases      | 2                  |
| Phrase 1               | bathroom direction |
| Wheight 1              | 100                |
| Phrase 2               | bathroom cleaning  |
| Wheight 2              | 50                 |

2920

173/192  
Figure 67A

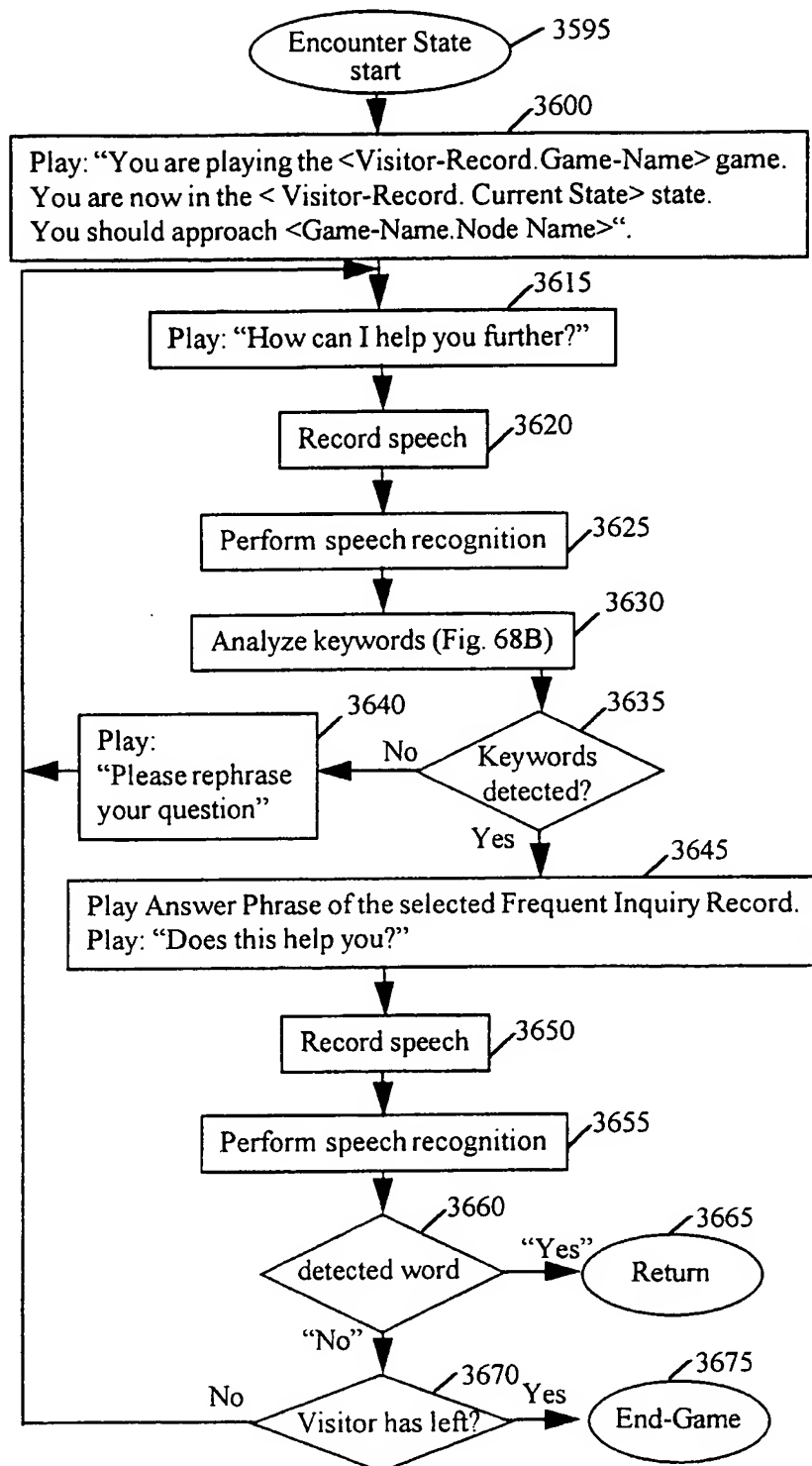


174/192  
Figure 67B

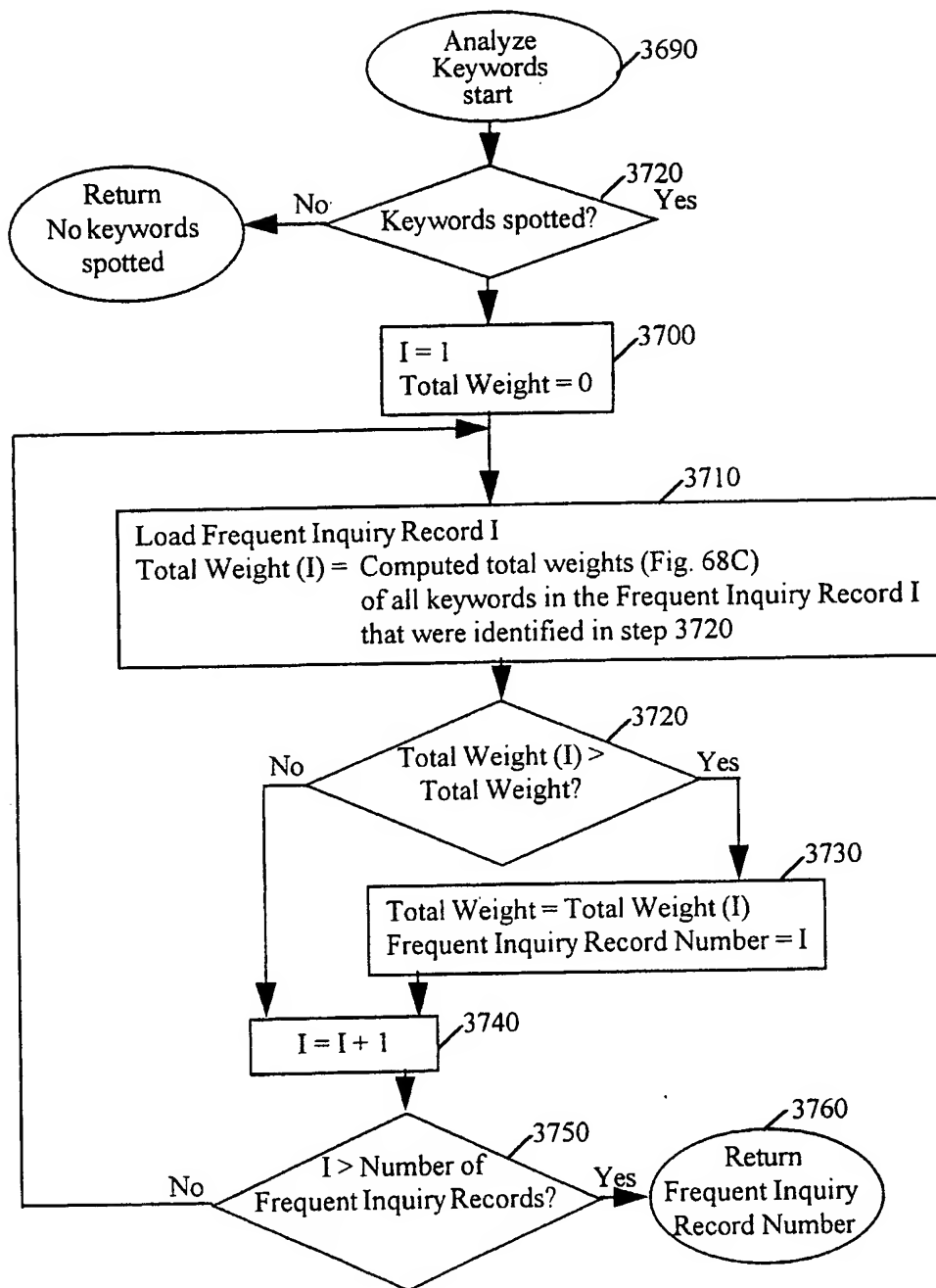




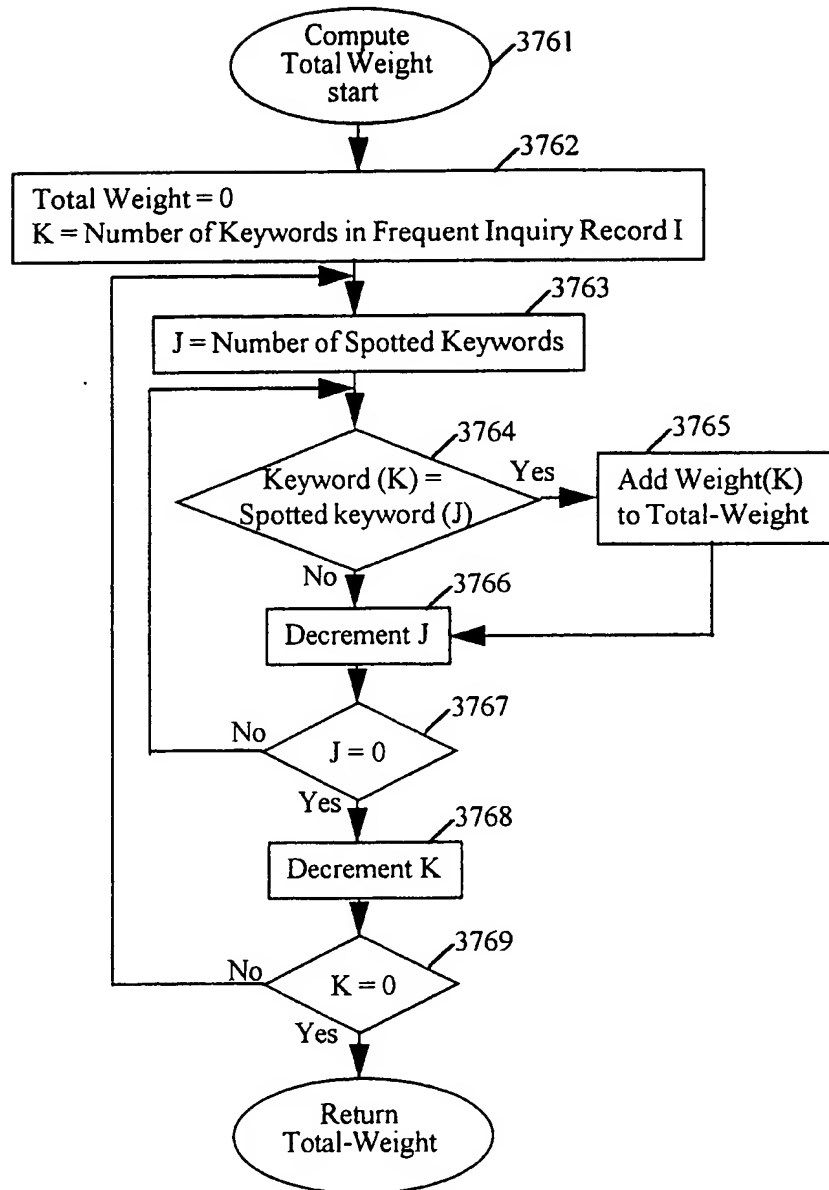
175/192  
Figure 68A

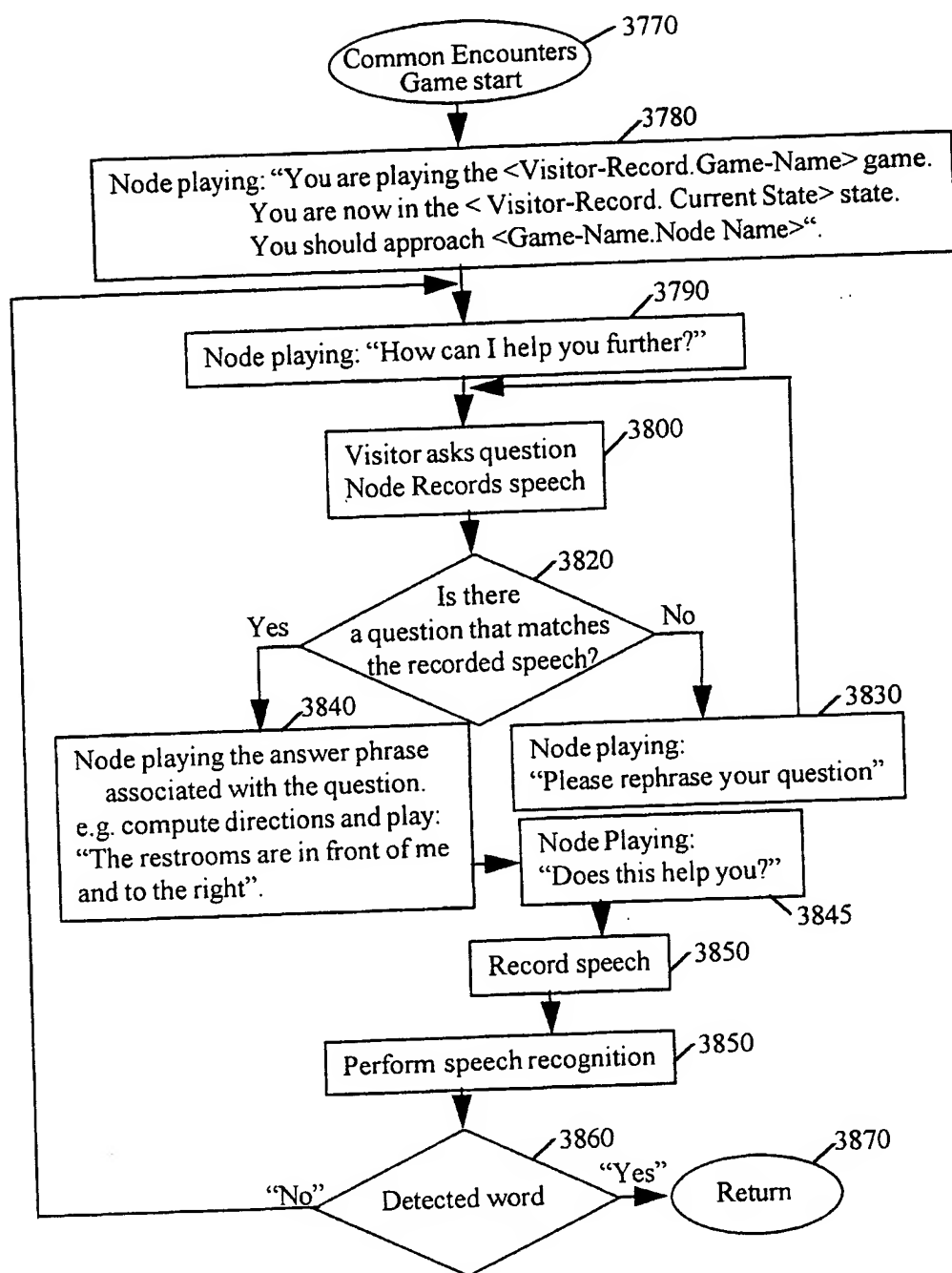


176/192  
Figure 68B

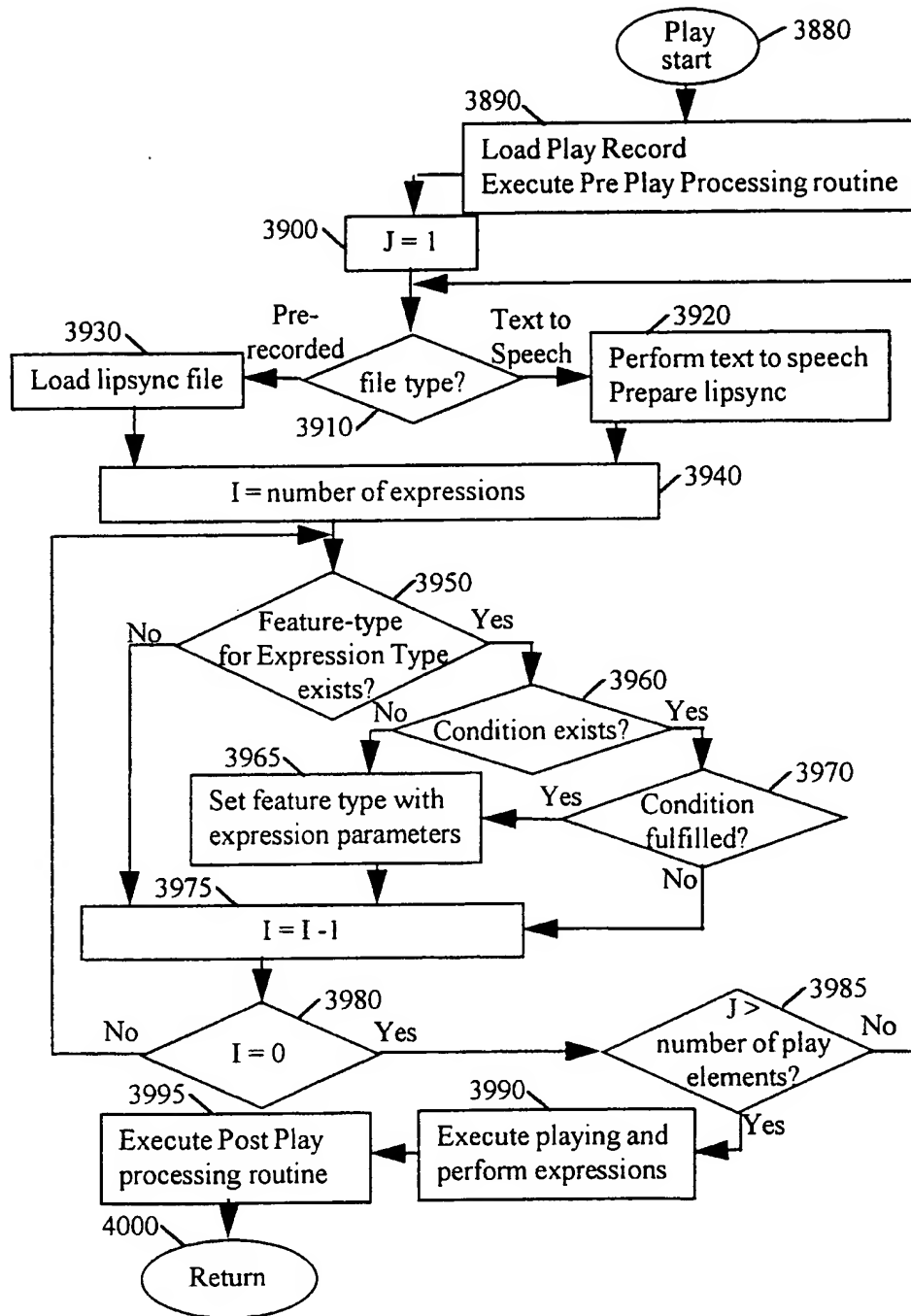


177/192  
Figure 68C

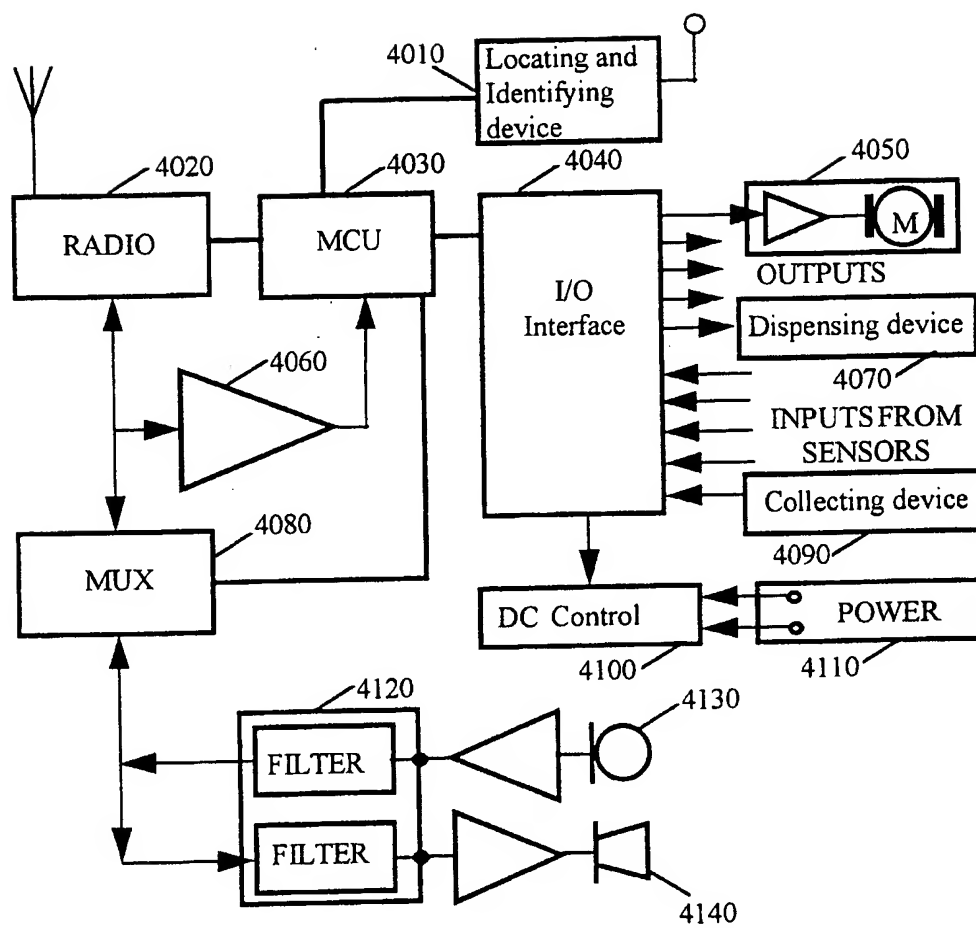


178/192  
Figure 69

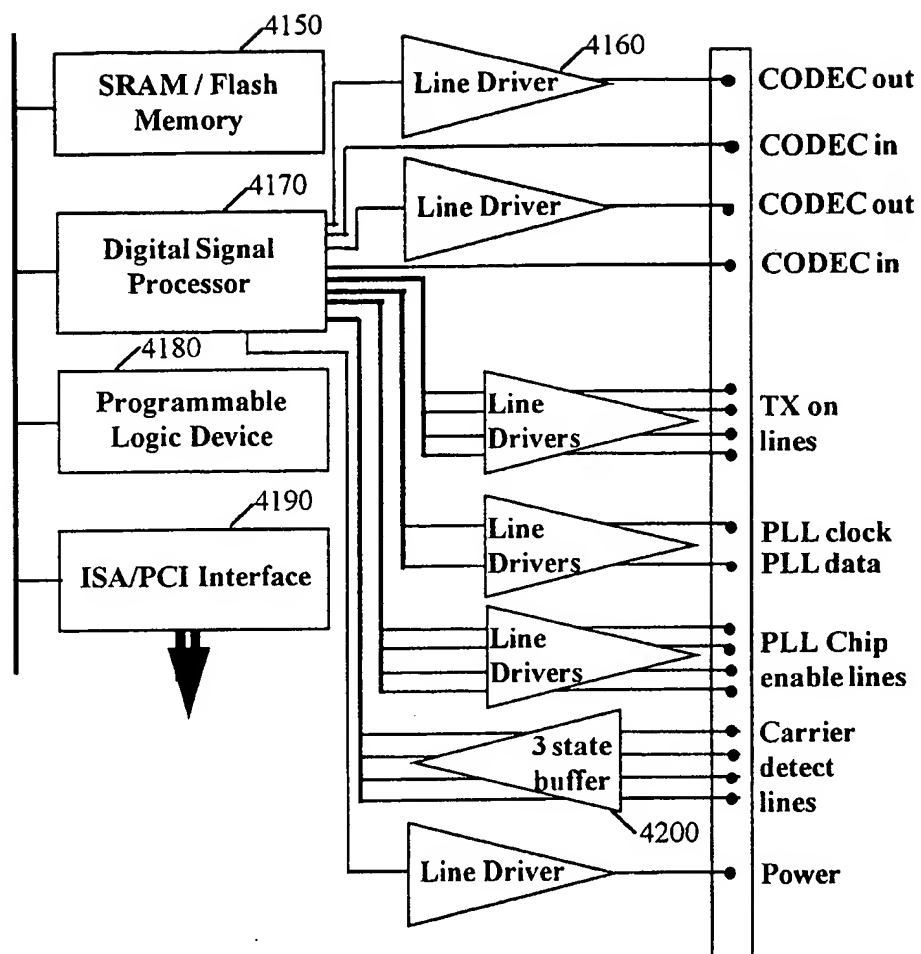
179/192  
Figure 70

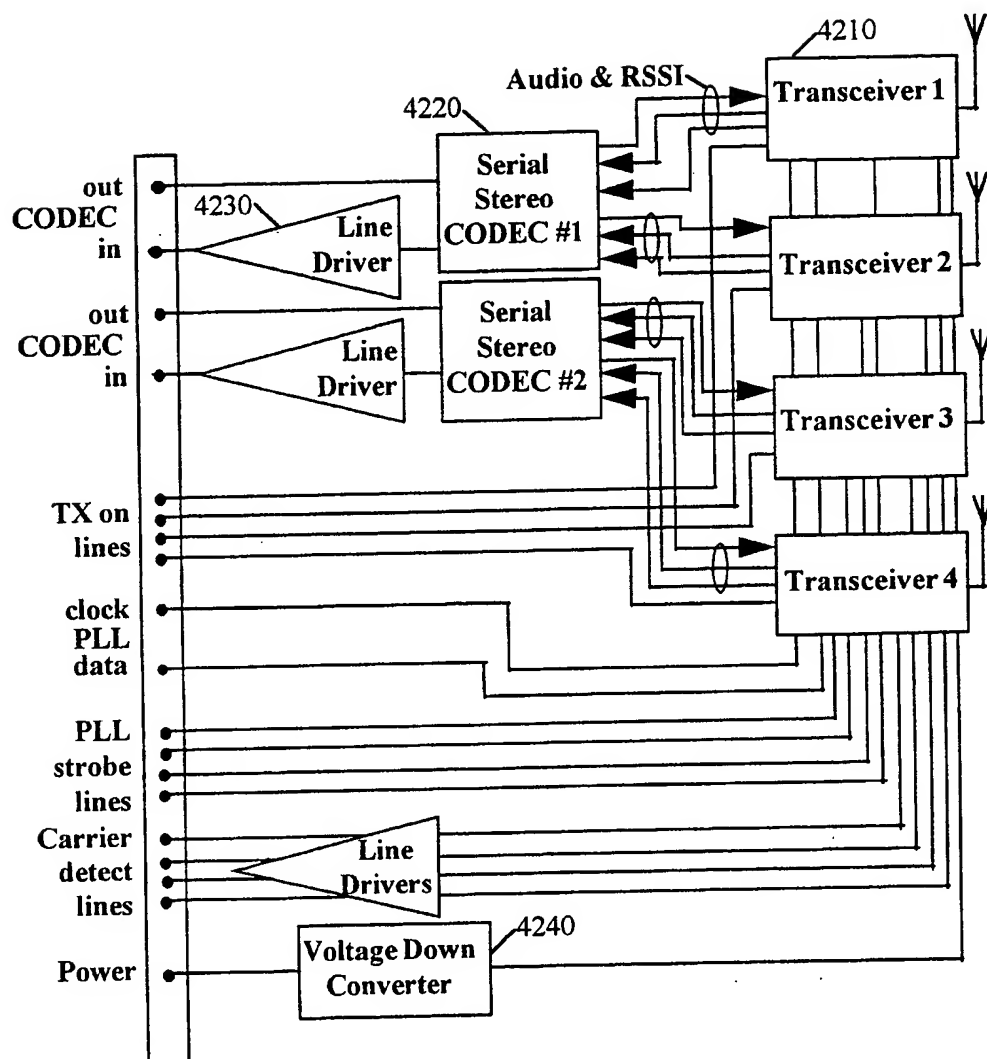


180/192  
Figure 71



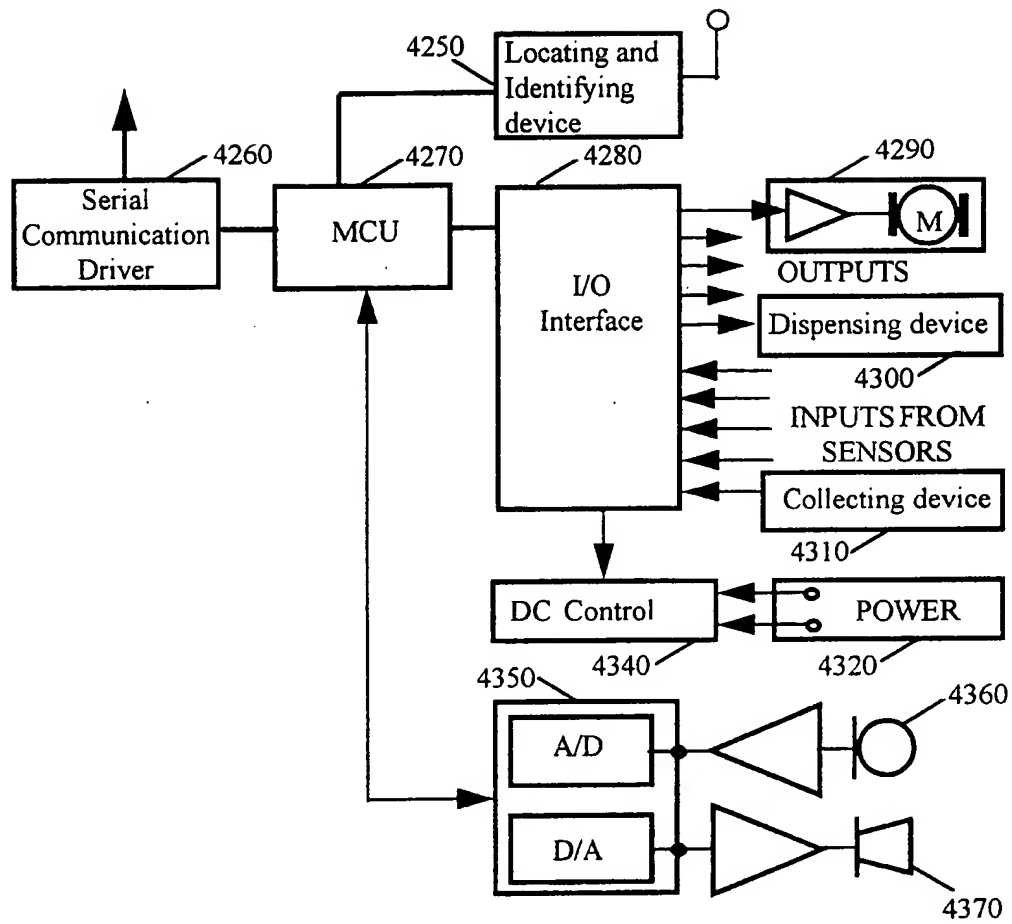
181/192  
Figure 72



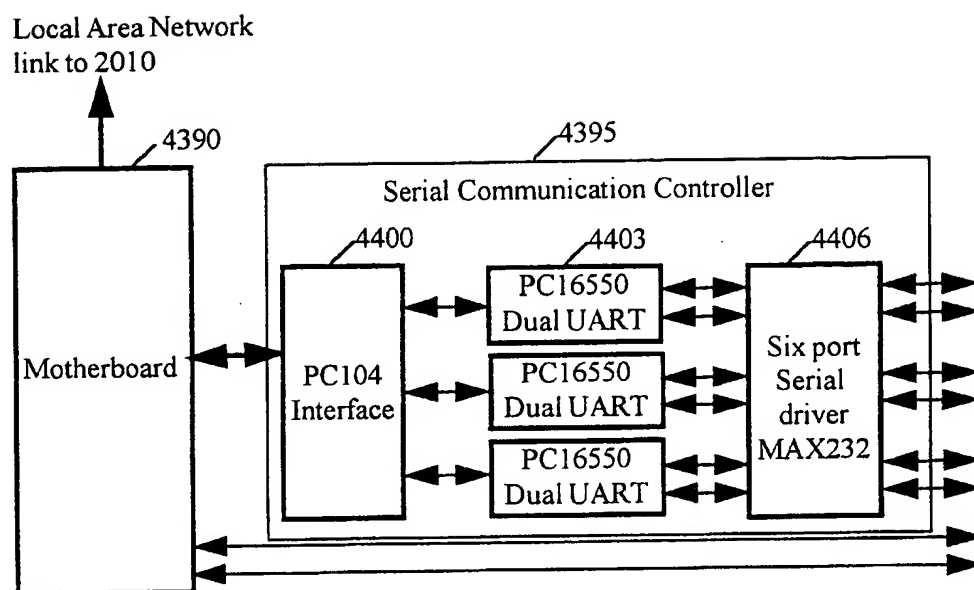
182/192  
Figure 73



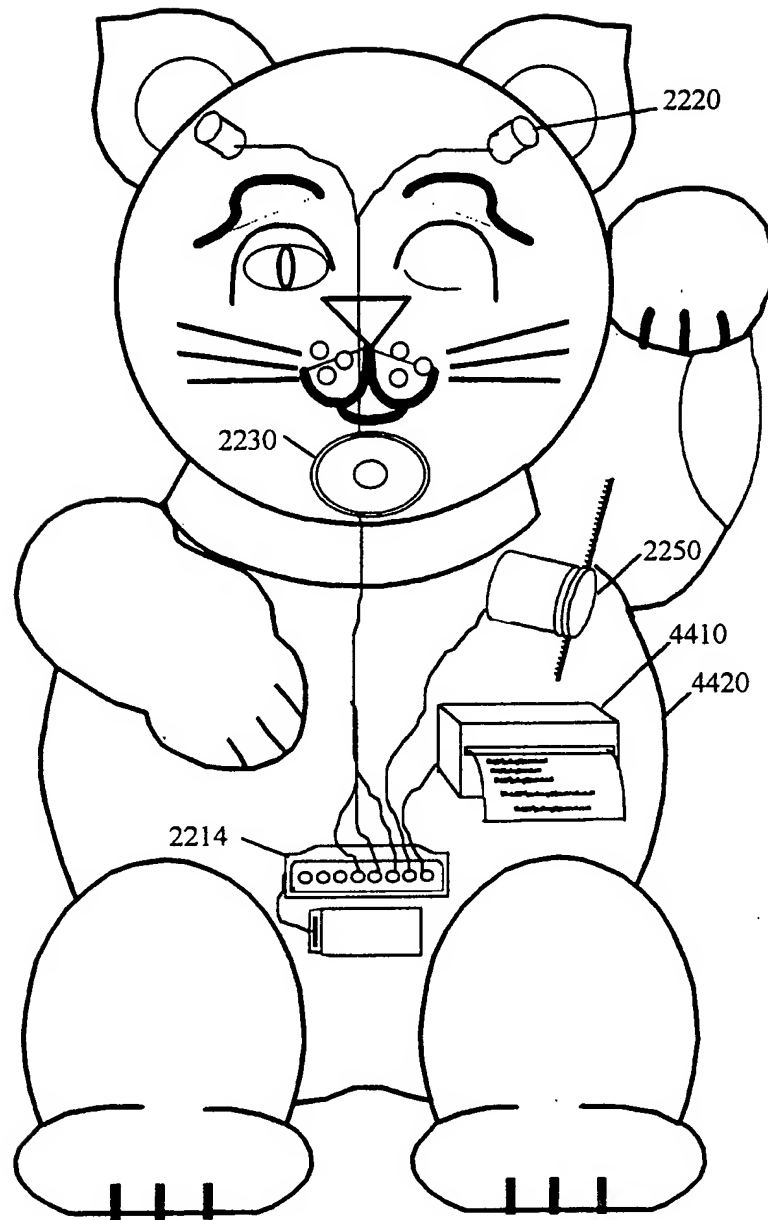
183/192  
Figure 74



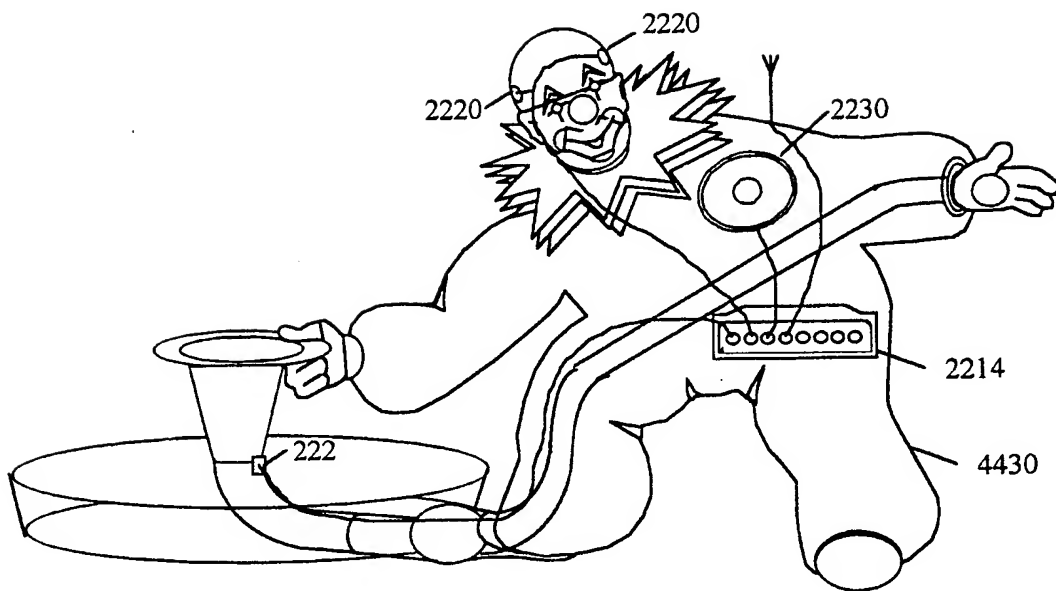
184/192  
Figure 75



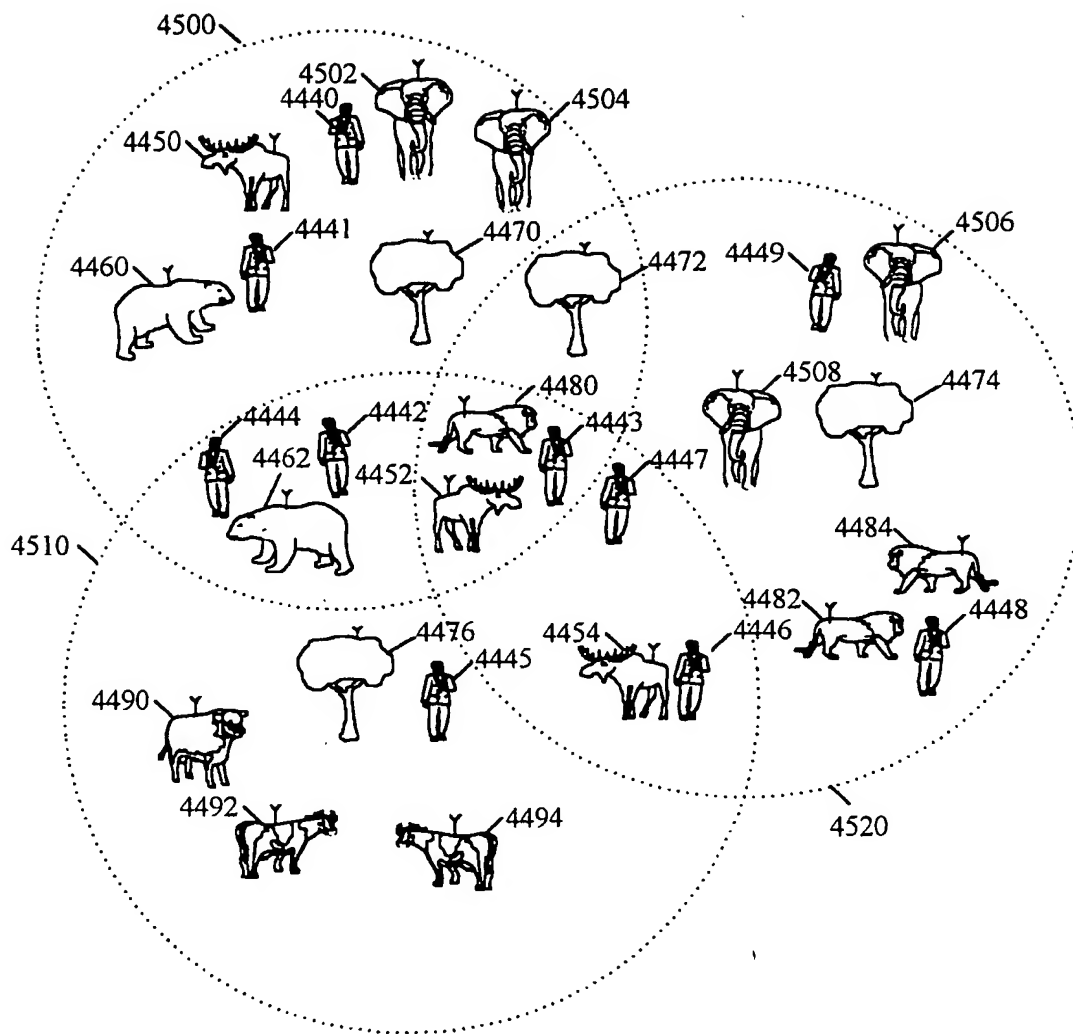
185/192  
Figure 76



186/192  
Figure 77

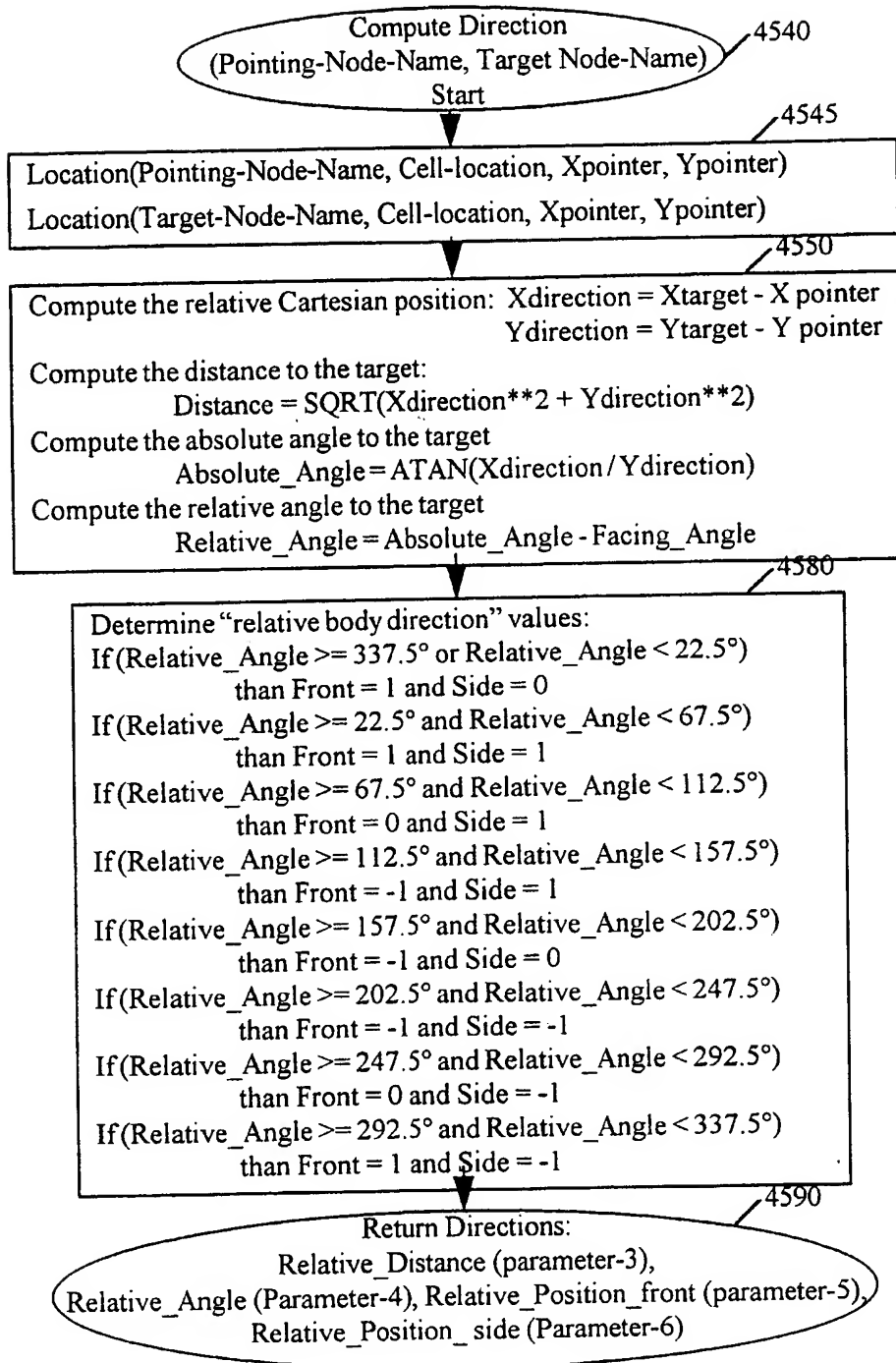


187/192  
Figure 78

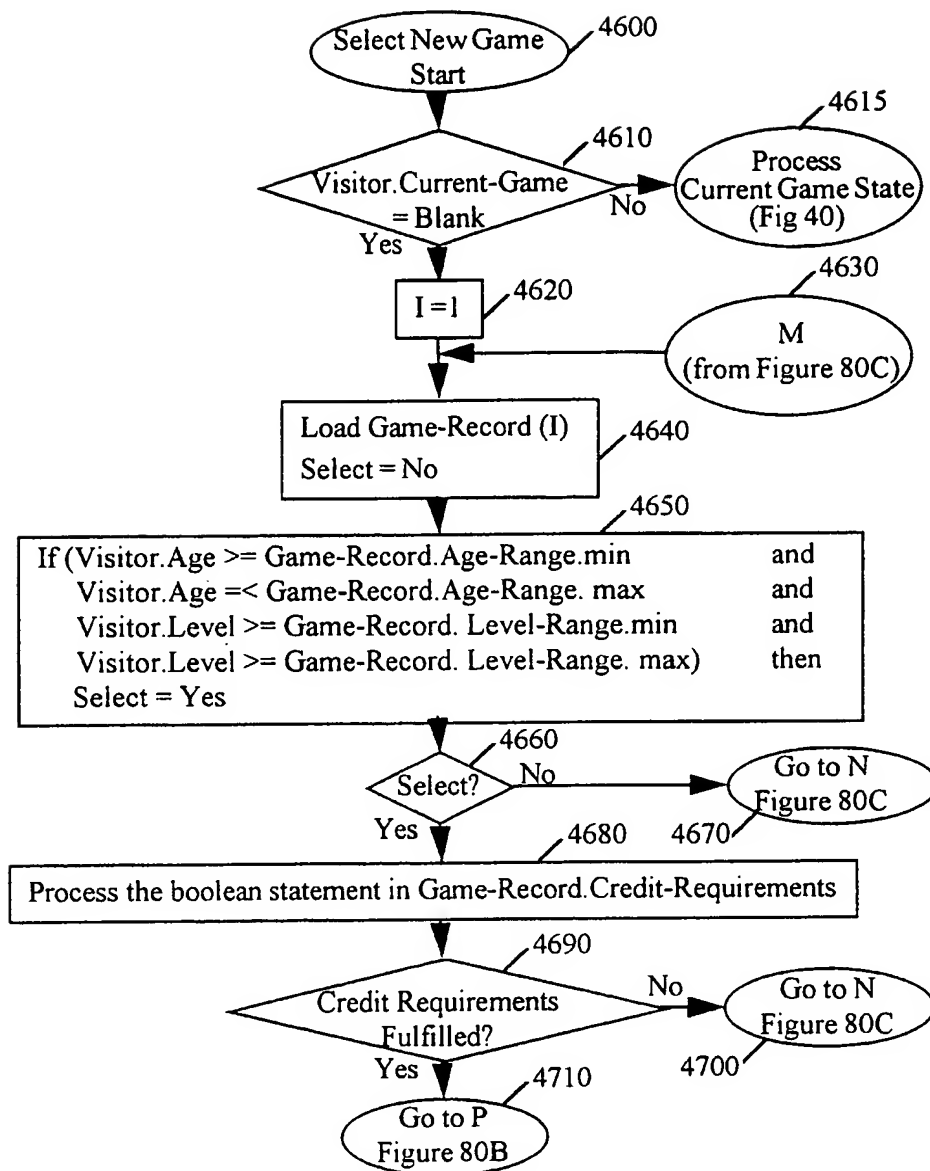


188/192

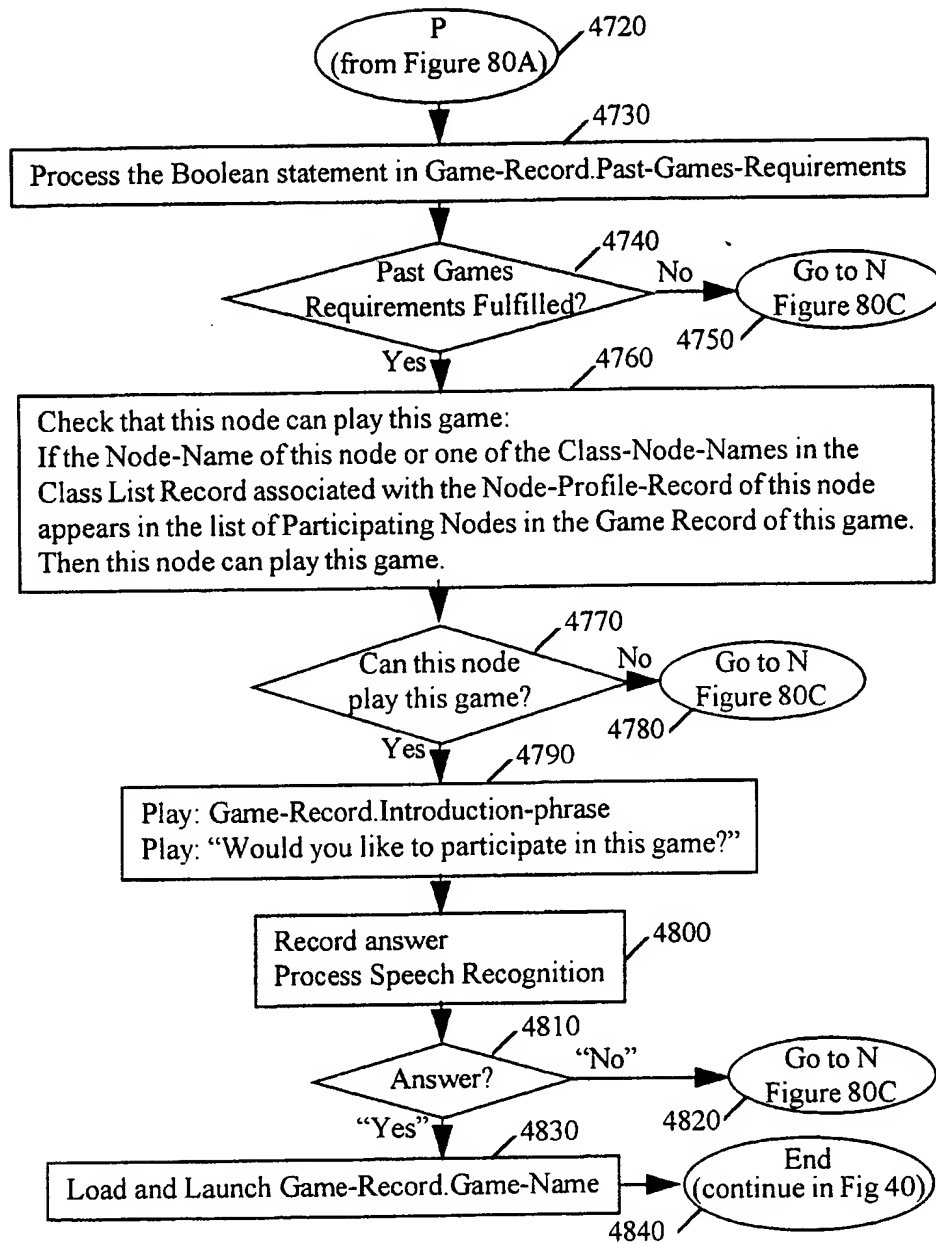
Figure 79



189/192  
Figure 80A

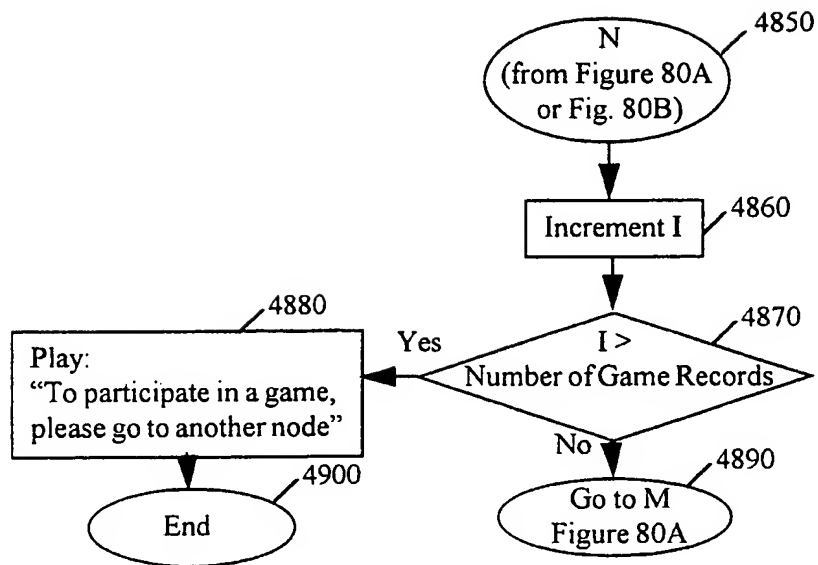


190/192  
Figure 80B

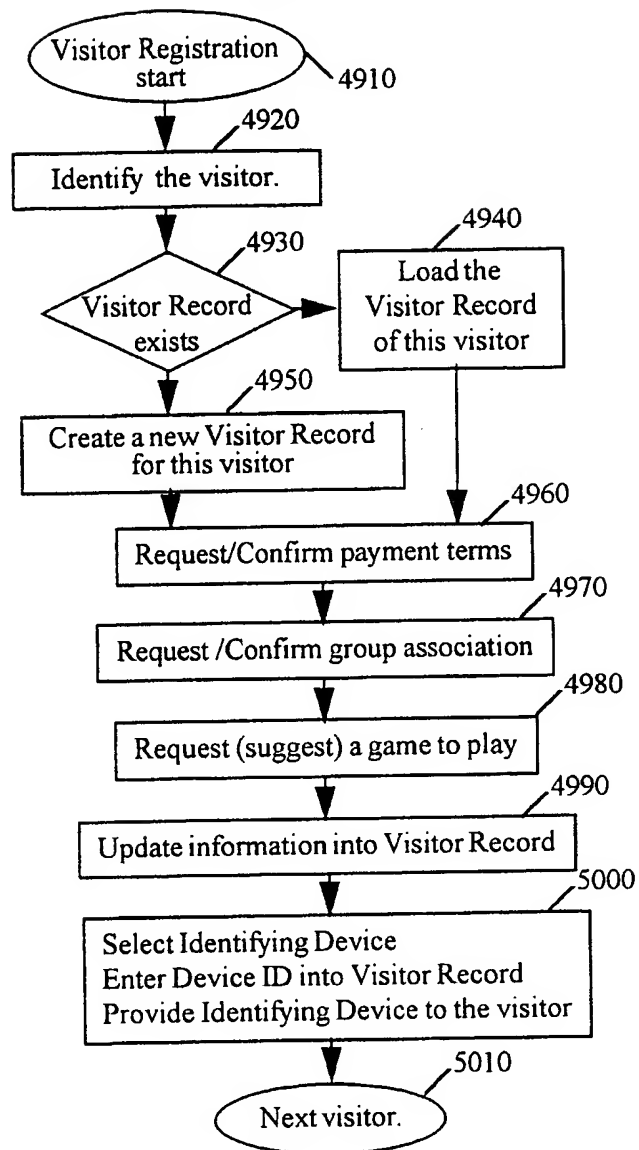




**191/192**  
**Figure 80C**



192/192  
Figure 81



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IL98/00392

| <b>A. CLASSIFICATION OF SUBJECT MATTER</b><br>IPC(6) : A63F 9/22; G09B 5/06; A63H 13/00; H04N 7/18<br>US CL : Please See Extra Sheet.<br>According to International Patent Classification (IPC) or to both national classification and IPC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                  |                                                                                                                                                     |                                          |                                                                                                                                                                                                     |                                                                                                          |                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                  |                                                                                                                                                                         |                                               |                                                                              |  |                                                                                                        |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------|--|
| <b>B. FIELDS SEARCHED</b><br>Minimum documentation searched (classification system followed by classification symbols)<br>U.S. : 463/42, 35, 39; 434/308; 446/301, 298; 40/1<br>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched<br>none<br>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)<br>none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                  |                                                                                                                                                     |                                          |                                                                                                                                                                                                     |                                                                                                          |                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                  |                                                                                                                                                                         |                                               |                                                                              |  |                                                                                                        |  |
| <b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                  |                                                                                                                                                     |                                          |                                                                                                                                                                                                     |                                                                                                          |                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                  |                                                                                                                                                                         |                                               |                                                                              |  |                                                                                                        |  |
| Category*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                               | Relevant to claim No.                                                                                                                               |                                          |                                                                                                                                                                                                     |                                                                                                          |                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                  |                                                                                                                                                                         |                                               |                                                                              |  |                                                                                                        |  |
| X<br>---<br>A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | US 4,339,798 A (HEDGES et al) 13 July 1982, figs. 1, 4-6.                                                                                                                                                                                        | 2 and 38<br>-----<br>1, 3-5, 11-15, 21-26, 29-37, 39 and 41-46                                                                                      |                                          |                                                                                                                                                                                                     |                                                                                                          |                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                  |                                                                                                                                                                         |                                               |                                                                              |  |                                                                                                        |  |
| X<br>---<br>Y<br>---<br>A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | US 5,504,675 A (CRAGUN et al) 02 April 1996, figs. 1-8.                                                                                                                                                                                          | 11-14, 22 and 41<br>-----<br>15, 21, 29 and 36<br>-----<br>1-5, 23-26, 30-35, 37-39, and 42-46                                                      |                                          |                                                                                                                                                                                                     |                                                                                                          |                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                  |                                                                                                                                                                         |                                               |                                                                              |  |                                                                                                        |  |
| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                  |                                                                                                                                                     |                                          |                                                                                                                                                                                                     |                                                                                                          |                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                  |                                                                                                                                                                         |                                               |                                                                              |  |                                                                                                        |  |
| <table border="0"> <tr> <td>* Special categories of cited documents:</td> <td>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"B" earlier document published on or after the international filing date</td> <td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"&amp;" document member of the same patent family</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td></td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table> |                                                                                                                                                                                                                                                  |                                                                                                                                                     | * Special categories of cited documents: | "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention | "A" document defining the general state of the art which is not considered to be of particular relevance | "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone | "B" earlier document published on or after the international filing date | "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art | "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "&" document member of the same patent family | "O" document referring to an oral disclosure, use, exhibition or other means |  | "P" document published prior to the international filing date but later than the priority date claimed |  |
| * Special categories of cited documents:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention                                              |                                                                                                                                                     |                                          |                                                                                                                                                                                                     |                                                                                                          |                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                  |                                                                                                                                                                         |                                               |                                                                              |  |                                                                                                        |  |
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| "O" document referring to an oral disclosure, use, exhibition or other means                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                  |                                                                                                                                                     |                                          |                                                                                                                                                                                                     |                                                                                                          |                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                  |                                                                                                                                                                         |                                               |                                                                              |  |                                                                                                        |  |
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| Date of the actual completion of the international search<br>14 JANUARY 1999                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                  | Date of mailing of the international search report<br><b>28 JAN 1999</b>                                                                            |                                          |                                                                                                                                                                                                     |                                                                                                          |                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                  |                                                                                                                                                                         |                                               |                                                                              |  |                                                                                                        |  |
| Name and mailing address of the ISA/US<br>Commissioner of Patents and Trademarks<br>Box PCT<br>Washington, D.C. 20231<br>Facsimile No. (703) 305-3230                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                  | Authorized officer<br>MARK SAGER<br>Telephone No. (703) 308-<br><i>Sheila Vanev</i><br><i>Paralegal Specialist</i><br><i>Technology Center 3700</i> |                                          |                                                                                                                                                                                                     |                                                                                                          |                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                                                                  |                                                                                                                                                                         |                                               |                                                                              |  |                                                                                                        |  |

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IL98/00392

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:  
1-5, 11-15, 21-26, 29-39 and 41-46

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.  
☐ No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IL98/00392

## A. CLASSIFICATION OF SUBJECT MATTER:

US CL :

463/42, 35, 39; 434/308; 446/301, 298; 40/1; 364/400; 340/825; 705/14; 704/232; 327/517

## BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I, claims 1-5, 11-15, 21-26, 29-39, 41-46, drawn to an amusement park apparatus or a system with each comprising information nodes.

Group II, claims 6-10, 16-20, 27-28 and 40, drawn to a system for dispensing infotainment.

The inventions listed as Groups I and II do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical features of Group I invention is the playing a plurality of games and a node controller controlling the nodes in a communication network claimed therein; while, the special technical features of Group II invention is the multiplicity of figures dispensing infotainment, a figure controller and a communication network claimed therein. Since the special technical features of Group I invention is not present in the Group II claims and the special technical features of Group II invention is not present in the Group I claims, unity of invention is lacking.

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